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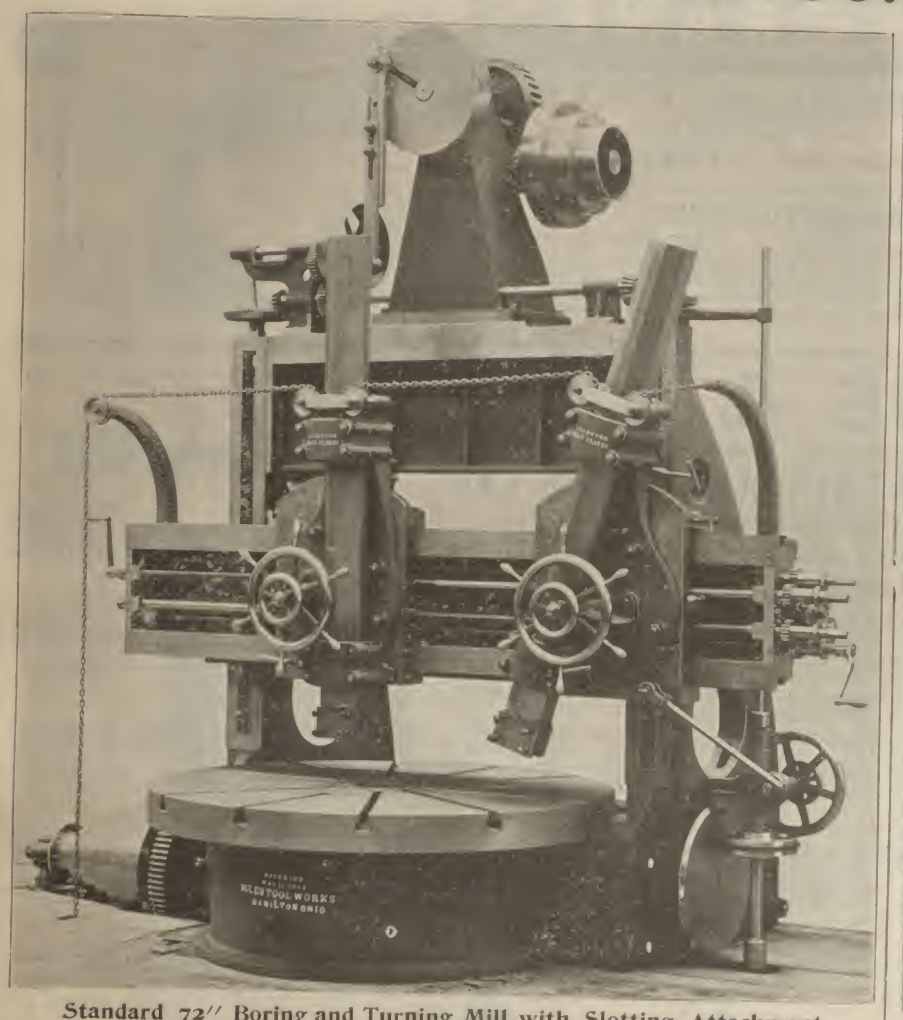

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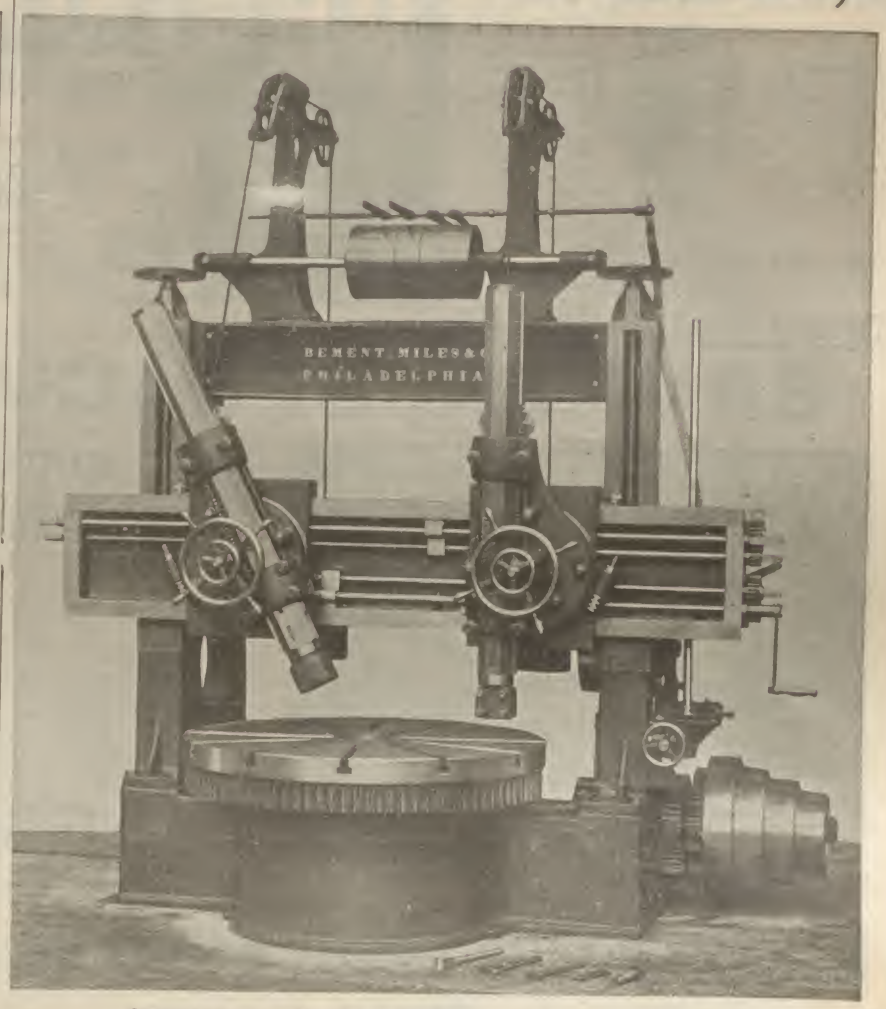

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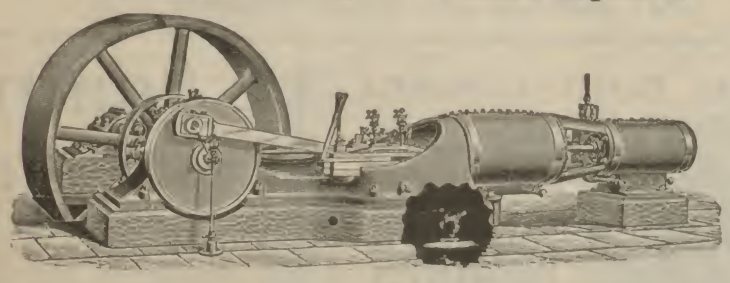

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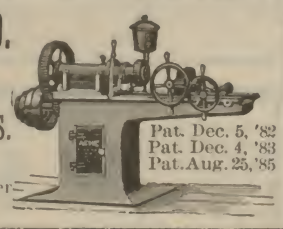

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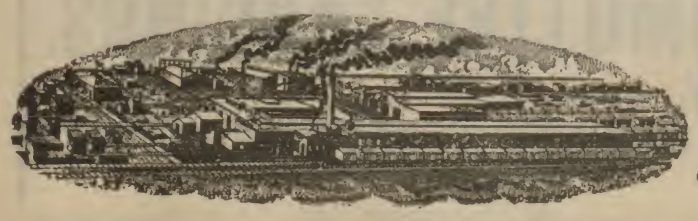

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THE RAILWAY REVIEW

XXXVI. MAY 30, 1896. No. 22.

UNUSUAL FLY WHEELS.—The great velocity at which fly wheels are driven and the consequent casualities that have become a matter of weekly report are evidence of slow evolution in providing for known wants. The sudden advent of electrical apparatus and its high speeds found people making fly wheels of cast iron, with a narrow factor of safety, or, indeed, no factor of safety at all, if we consider the impossibility of detecting inherent strains and imperfections in this material. No one can know the value of material molded into form at a temperature of 2,000 degrees and then cooled down to a fortieth of this temperature, nor can they judge internal structure by surface indications. The fact is that cast iron is not suitable material for fly wheels that are to be driven at high speed, nor is it necessary to make them of this material. There is not even the claim of cheapness in their favor, if the methods of making such wheels of wrought iron and steel were once worked out. Twenty years ago a Scotch firm, who had to make a large fly wheel for a spinning mill, riveted up a box rim,made from rolled plates, and filled it with cemented masonry or "grout," and did a very sensible thing. The strength of rolled sections is tolerably well known, their integrity is beyond doubt or can be so, and all that is wanting is some ingenuity and experiment to substitute this kind of material. One reason for using cast iron for fly wheels is to attain a section and stiffness of the arms that will, in the plane of rotation, resist the inertia and momentum of the rim. The sections of wrought-iron spokes required for radial or centrifugal strain are by far too weak for the driving strains, but this is easily provided for by diagonals as in the case of other iron structures.—Cassier's Magazine for June.

ENGINEERING EXPERTS IN LAW SUITS.—Lawyers usually make a serious mistake by considering engineering experts in the same light as any other witness in the case, says W. G. Berg in Cassier's Magazine. A brief conversation in regard to the particular features of the case is about all the information the average expert receives till placed upon the witness stand. Any engineer, connected with a large corporation transacting business in different cities, will readily bear testimony to the assertion that the methods of the various local counsels, all working for the same company, vary radically according to their individual temperament and peculiarities. Some discuss a case minutely with the engineer, while others actually wait till court day, and then, after a whispered conversation of a few minutes, held in one corner of the courtroom, enter upon the trial of the case, trusting to their legal instinct and the inspiration of the moment to pull them through. There are lawyers whose inclinations and ideas are toward scientific and engineering questions, owing to their having, in their younger days, been members of the "chain gang" of a surveying party or dabbled in a machine shop, or who have a hobby of following the latest developments in science and electricity. Others, through long years of experience in corporation matters, become expert in grasping and dealing with the engineering details of suits intrusted to them. But, as a rule, the engineering expert is capable of rendering much more valuable assistance as an adviser and educator in his particular sphere than acting merely as an ordinary witness.

The lawyer should acquaint his expert with all the facts in the case and then give him sufficient time to collect data, not only from his own actual practice and the practice of others, but also from the technical literature on the subject, so as to prepare an engineering brief to be thoroughly discussed with the lawyer prior to the starting of the legal proceedings. This brief and the subsequent consultation will aid the lawyer to grasp the technical details of the case and assist him in preparing a list of interrogatories and the general line for conducting the case as far as the engineering features are concerned.

UNIFORMED ATTENDANTS FOR EASTERN PASSENGERS VIA PENNSYLVANIA LINES.—Uniformed parcel porters will, free of charge, look after the comfort of all arriving and departing passengers over the Pennsylvania system at Jersey City passenger station, and will accompany them (if desired) between Cortlandt street ferry, New York City, and the American line pier, Sixth Avenue Elevated railroad and the Central railroad of New Jersey station; also between Desbrosses street ferry, New York City, and the Ninth Avenue Elevated railroad. They will also meet Pennsylvania line trains at Philadelphia Broad street passenger station and assist passengers who may desire their aid; take charge of rolling chairs when needed; meet carriages and make themselves generally useful to passengers. They will be in attendance from 6 a. m. to 12 midnight, and when accompanying passengers will carry parcels and hand baggage. They are not permitted to charge for this service, nor to intimate in any way that a fee will be expected. Any recognition of their assistance must be in the nature of a positive gratuity, entirely optional with the person served.

AN ENGINE WITH FIVE CRANKS.—The Inchmona, engined by the Central Marine Engine Works of Wm. Gray, & Co., Ltd., West Hartlepool, for Messrs. Hamilton, Fraser & Co., Liverpool, went on an extended trial trip May 4 and 5. The principal feature consists of the engine, which is provided with five cranks instead of the usual three. There are two low pressure cylinders of equal size, and the engines work on the quadruple principle, each of the five cylinders driving one of the five cranks. The cylinders are all in a straight line on the center line, of the ship, and all the valves are on the same line, immediately over the crank shaft, and driven by the ordinary link motion type of valve gear. The five cranks are set at equal angles around the crank circle, so that the propeller receives no less than ten impulses per revolution, besides which a much higher speed of revolution may be freely adopted than is usual with three crank engines. A three crank engine at 60 revolutions per minute, having six impulses per revolution, gives 360 impulses per minute; while a five crank engine running 80 revolutions per minute with ten impulses per revolution, will give the shaft 800 impulses per minute, or more than twice as many as the three crank engine. At the trials the engines ran so smoothly that at over 100 revolutions per minute there was no vibration of the ship whatever, although she was entirely without cargo. At this speed there are more than 16 reciprocating impulses delivered per second. The high speed in the reversal of impulses accounts for the absence of vibration in the ship. With five cylinders, of which, as in the case of the Inchmona, the diameters are 17 in., 24 in., 34 in., 42 in., and 42in., the three larger reciprocating weights can without difficulty be made exactly equal, and with a little scheming the weights of the whole five can be made equal.

INTERSTATE COMMERCE RULING.—The supreme court of the United States has just rendered a decision in favor of the Illinois Central Railroad company in a controversy with the state involving the validity of a state law requiring every railroad passenger train to stop at county seats within the state. It appears that the railroad company operates a line of road from Chicago to New Orleans, which passes Cairo at a point three and one-half miles distant from the station in that city. Six of the passenger trains on the road are run on a switch or a side track from the main line to the station in the city, but the fast mail train between Chicago and New Orleans, run under special contract with the postoffice department, and on a schedule fixed by the officials of the latter, doesn't go into the city of Cairo. Proceedings were begun on the relation of the state to compel the railroad company to run the train into the city under the provisions of the county seat law, and the supreme court of the state decided that it must do so. The company appealed to the subreme court of the United States, which held that the company need not run the mail train into Cairo, saying that, so far as the state law sought to compel the railroad company to make this unnecessary trip of seven miles by a through mail train, it was unconstitutional and void.

ENGLISH RAILS ABROAD.—English papers express the opinion that the present promises to be a good year for the export rail trade. The aggregate exports to April 30 this year were 179,579 tons, as compared with 94,663 tons in the corresponding period of 1895, and 89,952 tons in the corresponding period of 1894. British India has been the best external customer for rails in 1896 having taken 88,272 tons to April 30, as compared with 34,991 tons in the corresponding period of 1895, and 46,460 tons in the corresponding period of 1894. The deliveries to the Australasian colonies in the first four months of this year were 26,794 tons, as compared with 1067 tons and 5041 tons. Japan took 17,992 tons of British rails to April 30 this year, as compared with 16,553 tons and 9754 tons. There were sent 13,643 tons of rails to Mexico in the first four months of this year; the corresponding deliveries in the corresponding period of 1895 were 720 tons, and in the corresponding period of 1894, 4166 tons. The United States imported 8397 tons of British rails to April 30 this year, as compared with 3450 tons and nil in the corresponding periods of 1895 and 1894. The ease with which capital can be raised at extremely moderate rates of interest has, of course, encouraged the construction of new lines in British India. The Argentine Republic has also profited from the progress of Argentine agriculture. It is not a little surprising, however, to find a larger demand for these rails in the Australasian colonies, as the general condition of Australasian affairs still leaves a good deal to be desired. It is also not a little remarkable to find some inquiry for British rails in the United States, notwithstanding the great progress of American metallurgy.

LATEST TEST OF CARNEGIE ARMOR PLATE.—On May 13 a Carnegie double forged armor plate was tested at the government proving ground and broke all records. The plate represented a group of about 600 tons of armor for the Russian government's battleship Russia. It was 12 ft. long, 7½ ft. high and was eight in. thick, tapering down to four in. When attacked by nine imported Holtzer projectiles it not only repelled them all, but the projectiles were smashed into fragments. The first five shots fired were six in. in caliber and struck the plate in its thickest portion. They were given striking velocity ranging from 1827 ft. velocity per second to 1890 ft. velocity per second. All the shots struck the plate fairly and were demolished without penetrating. Then three four-inch projectiles with velocities averaging 1965 ft. per second were fired at the thinner portions of the plate. They also struck the plate fairly and suffered the same fate as their larger predecessors. The wonderful resistance of the plate decided Capt. Murtwago, the Russian representative, to give it a more vigorous attack. The six inch gun was again wheeled into position and loaded with another six-inch Holtzer projectile. The powder charge was increased so as to give the projectile the unusual striking velocity of 2,100 ft. per second. The result was the same. The splendid showing made by the Carnegie Company plates in this test and the one about a month previous so impressed Capt. Murtwago with their excellence that he proposes to recommend to his government that the next group of about 200 tons be accepted without the formality of a test.

STEEL CANAL AND LAKE BOATS.—The first fleet of steel canal boats of the Cleveland Steel Canal Boat Co. for this season arrived in New York May 13. It consisted of one steam barge with five consorts, all loaded to a draft of 5 ft., which is the maximum now practicable in the Erie canal. The fleet left Cleveland May 3 at 1 a. m., arrived at Buffalo May 4 at 8 a. m., left Buffalo May 4 at 6 p. m., arrived at New York May 13 at 8 a. m.; lost 10 hours at Buffalo on account of ice in the harbor, 4 hours at Brockport cleaning fires, 4 hours at Troy waiting for teams through single locks; total, 18 hours lost time. Actual running time from Cleveland to New York, 9 days, 13 hours; Cleveland to Buffalo, 31 hours; Buffalo to Troy, 5 days, 20 hours; Buffalo to New York, 7 days, 12 hours. The cargo included 653,000 lbs.of nails for export to Japan; 375,000 ft. of lumber for New York; 10 tons parafine wax for Germany, and a miscellaneous cargo for New York. The westbound cargo will consist chiefly of sugar for Detroit, Toledo, Cleveland and the southwest.

RUSSIAN IRON.—The iron industry in Southern Russia is rapidly developing, thanks, to a great extent, to the investment of Belgian capital. At the initiative of Belgian capitalists one iron works is built after the other, but although the bulk of the requisite money appears to hail from Belgium, home capital is also being invested in the same undertakings on no small scale. Not only are new works erected, but old ones are bought and extended; as an example may be mentioned the engineering works of Eson & Co., close to Iekaterinoslaw, which has been transformed into a branch of the new firm "Aciere du Midi de la Russie," where the first cast steel manufactory in south of Russia will be installed. Another new manufactory is the one of the Societe Metallurgique d'Estampage, close to the Nishne-Duleprowsk Railway station, on the Iekaterinen line, which, as the name indicates, will go in for stamped articles, bolts, screws, etc. The Parisian firm of "Barican" is building a machine factory at Nickolajew, and numerous other projects of a similar nature are in a more or less advanced stage. This universal impetus to new industrial undertakings is not confined to the iron industry alone. The Drewitzky coal mines have also been sold to a Belgian syndicate, and two other Belgian companies have been formed for the purpose of erecting glass manufactories in Southern Russia.

LEATHER PACKING.—I had a short note recently on hydraulic work, and may add that it has more wrinkles than an old man's brow says J. H. Allen in Dixie. Take the leather packing for example. I remember my first case of making a cup packing for a wheel press. Then I thought I knew how it was done. I soaked the leather and put it into the die provided by the makers, and secured a shape that was perfect. I oiled it according to rule and it fitted into its place like a hand in a glove, but in a week it was leaking as badly as the old one it had replaced. A second packing bought from a manufacturer remained tight in constant service for more than two years. I had bought a fine piece of oak-tanned leather but was not sure that it came from the back; it was hard and stiff and required much coaxing to make it take the required shape. He used a piece of hemlock leather, soft to the touch and as flexible as a damp rag. His leather was adapted to the purpose; mine was not. Mine may have come from the center of the back, I do not know; his was a selected piece cut from the back and he knew it. Mine was sole leather, his packing leather with all the difference between adaptability and non-adaptability. So, when you have to make a packing, don't run across the street to the cobbler's for your leather, but get something suited to the work, and then do not try to economize afterwards by attempting to work up the center that you have cut out. The chances are that you have squeezed that center so hard that it is worthless for making a smaller size of packing, and if you use it at all it had better be for gaskets and washers. Yes, I think you will find a wrinkle or two hovering around the making of leather packings.

LOCOMOTIVE RATING AND FUEL,*

TRACY LYON.

The possibilities in the direction of improving the methods of rating or loading locomotives and of reducing their relative consumption of coal, coupled with the rather strange fact that these most important points have been so long neglected, have been much discussed during the past year and may be considered as unquestioned. The problem now before us is one of method, and it is the subject of this paper to show briefly the means which have been used in working in such a direction.

The subject of rating naturally comes first, as it is generally conceded that the proper unit upon which to base the consumption of fuel by a locomotive is the

*Abstract of a paper read before tho Western Railway Club.

ton-mile and the use of such a unit pre-supposes that the load of the engine is considered as so many tons rather than as so many cars or as that most indefinite of terms, a "train."

It has been our experience that the maximum capacity of locomotives over the various grades can only be determined satisfactorily by means of a series of actual tests under favorable conditions, these tests being made with a carefully weighed train with frequent observations of the speed of the engine, steam pressure and cut-off, In making such tests the stops usually necessary in service must be taken into consideration, as their location, as affecting the run which can be made at a hill, governs in many cases the load which can be carried over it.

In making comparisons it will be found convenient to plot a series of hyperbolic curves, one for each class of engine and based upon their relative traction; one ordinate being the train resistance in pounds per ton and the other the load in tons between the engine and caboose. For such purposes we have found that satisfactory results are obtained by basing the maximum efficient traction, which can be developed at low speeds, upon a mean effective pressure in the cylinders of 80 per cent of the boiler pressure. The capacity of one class of locomotives over a certain part of the road having been determined by test, that of another is easily and, by our experience, satisfactorily obtained by such a simple comparison of their traction.

As to the train resistances, we find that 6 lbs. per ton fairly represents the wheel resistance of a loaded car under ordinary conditions, to which is to be added the grade resistance and the resistance of curves, which is too indeterminate a quantity to say much about, but is sometimes placed at one-half of a pound for each degree of curvature. After having determined the capacity of the locomotives over the principal grades in each direction, it will be found necessary, assuming that the road under consideration is an average one as far as physical conditions are concerned, to divide it into a series of blocks or sections with reference to the ruling grades, location of stations and other fixed points, each one of these sections representing a different rating. An independent series of sections will of course have to be made for each direction, their terminals only coinciding of necessity at division points.

Our method of making up trains is as follows: The weight of each car load, both car and contents, is first inserted in the way bill by the agent. Fractions are not used, less than 1,000 lbs. being dropped and over 1,000 counted as one ton. This information is shown on the switch list used by the yard men in making up the train, empties being given an arbitrary weight according to the class of car. The weight of the cars and contents in the train, having been inserted in the conductor's report, is certified to by the agent and this information is sent at once to the dispatcher. At all stations where cars are picked up or dropped; the conductor enters their weight upon his report and also wires it to the dispatcher. It willbe found absolutely necessary to check these reports of tonnage—for some time at least—in order to obtain results satisfactory in any degree. One of the principal difficulties to be met with is the making of proper allowance in the weight of the trains for unfavorable conditions of rail and weather. To the discretion of the dispatcher who receives a telegraphic report of the weather and condition of rail from all stations twice a day, is left the decision as to whether a train shall be made up to first, second or third rating, the yardmaster having standing orders to load all trains to first rating in the absence of other instructions. There are certain exceptions however, in the case of fast time freight and stock trains, which uniformly receive second or third rating.

In arriving at such a classification we have made certain assumptions which would seem to be borne out by practice. To the total train resistance in pounds per ton, obtained by dividing the traction of a certain engine by the maximum load or first rating, is added 2.4 lbs. and the loading or rating corresponding to this increased resistance represents the second rating for that engine, that is to say, for an inferior condition of rail and weather. To obtain the third or still inferior rating, representing the most unfavorable conditions ordinarily met with, we add 4.4 lbs. to the train resistance corresponding to the maximum rating. This method would seem to have an advantage over that of making a horizontal reduction in the rating of a certain percentage, in that it decreases it in a proportionately less ratio as the tonnage decreases.

For a train composed entirely of empty cars, a further reduction of 10 per cent is made in the rating; if only one-half the cars are empty the reduction is 5 per cent, and other proportions in the same ratio. These figures are based upon the assumption that the wheel resistance per ton of an empty car is one-third greater than that of a loaded car, or as 8 lbs. to 6. The practice of increasing the weight of an empty car to allow for empties in making up the tonnage of a train, is sound in principle, but objectionable if it is desired to obtain the actual tonnage.

After all has been said, the sole object in view is to run the trains with as few engines as possible, and if they haul as near the maximum loads in one direction as the conditions will permit, the other direction will take care of itself. We, therefore, measure our performance by the amonnt of the train wages per ton mile in the direction of the greatest traffic. This is the key note of the whole thing.

Since the establishment of the tonnage rating system on the Chicago Great Western Railway in January, 1894, the increase in the average number of cars per train has been 3.8 or about 21 per cent. This, however, is not a full measure of the benefits derived, as during the corresponding period the average tonnage for a loaded car has also increased by about 15 per cent. As a net result, the weight of the average train, as compared with that before the tonnage rating went into effect, has actually increased by about 40 per cent. in spite of the fact that many more fast trains, and consequently lighter ones, are being run now than previously. This result is further born out by the corresponding earnings per freight train mile, which have increased in the same relative ratio.

The most feasible means of testing coal would seem to be by its consumption in a stationary boiler under forced draft, in connection with a sufficient chemical analysis, to determine whether or not the coal is unfitted for use by reason of sulphur or other deleterious constituents.

A year ago such a testing plant was established by the Great Western and some sixteen samples of Illinois, Iowa and other coals were tested before the annual coal contracts were awarded. Each sample consisted of a car load of coal purchased by us of other railroads, with one exception, when it was necessary to obtain the coal directly from the mine. This coal was obtained in box cars as far as possible, in order that it might be received in approximately the condition that it was mined. The plant consists of a small locomotive boiler, carefully lagged, with the steam outlet carried into the stack through a variable nozzle, in connection with the ordinary form of diaphragm. Apparatus is provided to weigh the coal and water (which is fed into the boiler by an injector) as well as the necessary thermometers, calorimeters and draft gages, all the usual observations in boiler tests being made. The grates used are regular locomotive grates and the dampers are similar in construction to those used on the road. The average steam pressure used was 90 pounds, the average draft in the smoke box being 3.5 inches and the average consumption of coal 90 pounds per square foot of grate area. Each test lasted eight hours, the coal consumption in that time being 4½ to 5 tons.

After having obtained the evaporative value of each coal reduced to a uniform basis, together with the physical characteristics of each, the prices were taken into consideration and computations made: 1st. The relative value of the coals f. o. b our line, based upon a unit of cost and the evaporative value. 2d. The cost to evaporate 100 pounds of water at certain points where a number of coals might be delivered to advantage, based upon the actual cost of each coal, the cost of transportation from the various points of delivery to the point where the coal is to be used (depending upon the direction of the greatest traffic) and the evaporative value. A great many such comparisons can be made with profit, based upon various conditions, not only in determining which coal to buy, but in districting it afterwards. This matter of districting it is a very important one, involving as it does the keeping of certain coals within certain districts, as well as the delivery of one coal or another at a certain point, depending upon the supply and direction of traffic.

There can be no question of the importance of using, as far as possible, but one kind of coal on each division, as the adjustment of the engine for a certain coal as far as grates, arches, exhaust nozzle and diaphragm or petticoat pipe are concerned and the knowledge of how to handle it to greatest advantage by the engine men, enter largely into the economy of its use.

For convenience we have adopted as a unit the coal consumed per 10,000 miles of total train, including the weight of the engine and tender, and the consumption varies under the same weather conditions from .5 ton to 1.2 tons per 10,000 ton-miles for different trains, divisions and directions.

The measurement of coal on the engine may first be considered, almost all roads lacking facilities to accomplish this accurately. We have in use for loading coal both buckets and chutes and in some cases load directly from a car or dock. Where buckets are used either directly or to fill the chutes, platform scales are provided and a sufficient number of buckets weighed each day to enable the men to fill them with a fair degree of uniformity, usually to 1,000 or 1,100 lbs. We have experimented with various forms of spring scales hung above the bucket, but so far they have proved too inaccurate. The contents of the chutes are gaged by their cubical contents and the weight per cubic foot of the coal used, which is determined by measuring and weighing a considerable quantity of coal in bulk. Where the coal is shoveled directly from the dock, the number of scoops is counted. I find that considerable dependence can be placed upon the judgment of the men who handle the coal and that they soon get to be able to make very close estimates.

To check these figures to a certain extent we have established a standard location for the back coal boards and gates on all classes of tenders and determined by weighing what the capacity of each class of the latter is as usually loaded. Each tender is marked with a row of rivets on the center line of the side of the coal pit, indicating the number of tons contained when the coal is shoveled into the back of the pit and leveled off with its top, which is done upon the arrival of an engine at a terminal.

Inasmuch as one crew does not run continuously on the same engine, it is necessary to consider each trip by itself in order to obtain each man's record separately.

When an engine leaves the round-house the engineer is given a slip showing the amount of coal on the tender, he enters upon this slip the amounts he takes at intermediate points (which are checked against the tickets turned in by the coal men) and delivers it to the roundhouse foreman at the end of the trip. The latter measures the amount of coal in the tender on arrival and enters all these items on his daily report of engines "in." There is also shown on this report the time the engine is idle under steam or switching before and after coaling and the amount of coal with which it goes out.

This latter amount is arrived at by adding to the amount on the tender upon arrival the amount taken at the terminal. These amounts are checked as soon as received and entered upon a sheet containing the record of one train for a month. Upon this sheet are shown the total ton-milage of each train, the consumption of coal, and the number of hours idle under steam and switching on that trip (obtained from the train sheets as well as the roundhouse foreman's report) and finally, after deducting an allowance of 50 pounds of coal per hour for being idle under steam and 500 pounds per hour for switching, the net consumption of coal, which is comparable with the work done. The allowances referred to some times do not amount to very much, but they are valuable in their moral effect in assuring the men that their records are true. The amount of coal accounted for in this way usually comes within 1 or 2 per cent. of the amount charged as received.

In order to be able to compare the work of men on different trains and divisions we have established a basis or allowance in tons of coal per 10,000 ton-miles for each class of train in each direction and on each division, this allowance having been arrived at by a long series of experiments and records of amounts consumed, and representing, not the average, but the best performance which could be expected under favorable conditions. On the performance sheets which are posted monthly in the roundhouse are shown opposite each engineer's name the amount of coal he used during the month, the amount allowed him (based upon the ton-miles made and the class of service performed), and the percentage of excess of the latter over the former. The performance of the men is therefore measured by this percentage and if they have used less than the allowance, which is not an unusual thing in the summer, the percentage is shown in red—a very enviable distinction.

The additional expense incident to this work is represented with us by the cost of the stationery needed and by the wages of two clerks, whose entire time is devoted to tabulating the reports and getting out the performance sheets, and possibly a helper at roundhouses where the force is already at the minimum point, in order that the coal may be properly shoveled into the pit of the tender.

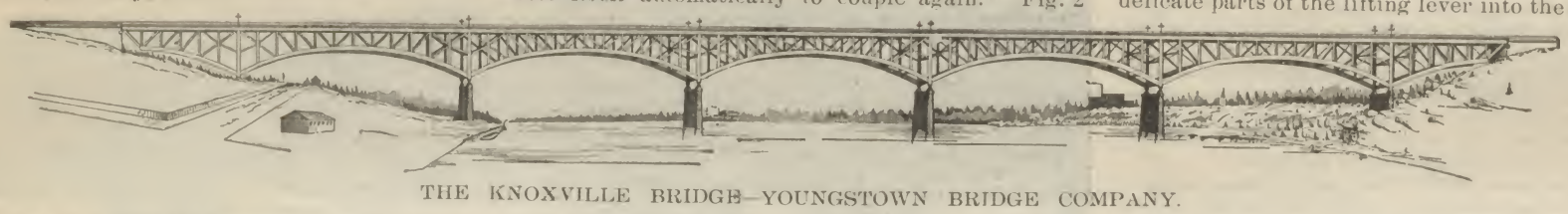
Our men are now thoroughly interested in the matter of coal consumption—which is half the battle—and I think feel on the whole an entire confidence in the records. Their work as far as coal is concerned is now considered as one of the most important factors in their personal record, and is is understood that a continual poor coal record will result in dismissal, or at least a loss of rank.

With the tonnage system the men do not shirk heavy trains, they would prefer to pull the full capacity

of the engine, as by so doing they can make their best record. The only tendency which we have to combat is one of crawling up hills, and running down them at too great a speed.

BRIDGE AT KNOXVILLE, TENN.

The accompanying illustration has been received from the Youngstown Bridge Co., of Youngstown, O., showing the design which was recently adopted for the Tennessee river bridge, at Knoxville, Tenn. The bridge is 1,700 ft. long and 42 ft. in width over all. It carries a 30-ft. paved roadway with two street car tracks and two six-ft. sidewalks. The north abutment is 127 ft. long and the south abutment 60 ft. The piers in all cases are carried down to solid rock. The contract was awarded to the Youngstown Bridge Co. on May 12 of this year by the county court of Knox county, Tenn.



THE KNOXVILLE BRIDGE—YOUNGSTOWN BRIDGE COMPANY.

That there is a decided tendency in this country toward the adoption of artistic designs for city bridges of importance and that this tendency is growing is exemplified by the selection of designs of Melan concrete arch structures at Topeka, Kan., and Patterson, N. J. The case of the design under consideration furnishes an additional example showing that the public demands something more than mere safety and stability in the case of this bridge over the Tennessee river. The bridge is to be located at Gay street, the site being especially well adapted to bring out the features of an attractive architectural design. The first proposal was to build a stone arch structure, using the beautiful Tennessee marble, of which material there is an abundance in the vicinity, and one design for such a structure showed four spans of 240 ft. each. If this had been carried out each span would have exceeded by 20 ft. the length of the longest stone arch in existence, which is the Cabin John bridge at Washington, D. C. In another design, a single large span arch was shown with 150 ft. spans on each side. On examination of the estimates for a structure of the latter mentioned type, using either stone or Melan concrete construction, it was found that the cost would be about a half million dollars, which decided the question against a masonry structure. This decision, however, was reached reluctantly.

At about the same time with the others proposals were received for a steel truss bridge with a straight deck and wooden floor. The Youngstown Bridge Co., of Youngstown, O., in submitting its estimates presented plans designed with a view of giving as handsome a structure as could be built out of steel, and yet give the necessary waterway and head room for navigation. This was accomplished by making an arched cantilever design, which gives all the appearance of an arch without the great thrust on the piers. The agitation in favor of a stone bridge has given the public a strong prepossession in favor of a design with some claim to artistic merit, and the result was the adoption of this design by the county court. It is certainly creditable to the designers and will be an ornament to the city.

THE HIEN DOUBLE AUTOMATIC COUPLER.

The accompanying engravings illustrate the Hien Double Automatic Coupler, which is seen to be of the M. C. B. type and contour. The principal feature of the design is the locking device. The arrangement consists of a revolving lock which is alternately revolved by the lifting pin and the tail of the knuckle, so made that all catches, cams, notches and other devices for holding the release lever on the car end, which are used on many couplers, are entirely dispensed with in this one, and the bending of the release lever or extension or stretching of the connecting chain between the lock and lever will not effect the uncoupling device. With many forms, two cars being coupled together, to uncouple it is necessary for the lever to be raised and fastened in the raised position, holding the coupler lock in an unlocked position until the cars pull apart. After the cars are parted they cannot be coupled again until the yardman releases the lever and places it in the cam or notch. It will thus be seen that with the ordinary M. C. B. couplers two operations by the yardman are necessary to uncouple a car and then couple it up again. With the Hien coupler one operation accomplishes this by merely raising the lever and letting it go. It then falls into its normal position, and consequently the yardman is not required to leave the switch in drilling cars. All he has to do is to make the "cut."

The whole drawhead is larger and is claimed to be stronger than that of any other coupler now on the market. The ears of the coupler carrying the knuckle have also been increased proportionally, thus giving additional strength to avoid breakages. The lock having broad wearing surfaces is not likely to wear loose or deteriorate in service. It is compact, simple and strong.

In the illustrations Fig. 1 shows the coupler locked; Figs. 2, 3 and 4 show the various positions of the lifting pin, the locking block and knuckle, as placed by the operation of the coupler under the instructions placed on each car, viz.: "To uncouple raise lever and let go. In the act of uncoupling the lock sets itself automatically to couple again." Fig. 2 shows the position of the lock when the lever has been "raised and let go." Here the locking block is revolved to such position that the tail of the knuckle is free to sweep open. Fig. 3 shows "the act of uncoupling." Here the tail of the knuckle is half open and has revolved the locking block back to the original position. Fig. 4 shows "the lock setting itself automatically to couple again," the tail of the knuckle being completely open, with the locking block in position for coupling again. As the tail of the knuckle is swept back to the position as shown in Fig. 1 the locking block rises to allow it to pass, it then drops by gravity and blocks the tail of the knuckle as shown in Fig. 1.

FIG. 1. THE HNIE COUPLER.

The knuckle has been increased in depth considerably, and also in thickness where possible thus, according to the makers, rendering it probably 25 to 30 per cent stronger than any other knuckle of the same type. The wearing surfaces between the tail end of the knuckle and lock are large, which is expected to eliminate wear between the tail of the knuckle and the lock. It is well known that wear between the tail of the knuckle and lock decreases the lifetime of the knuckle. In some cases this wear is said to have existed to such an extent that trains have uncoupled. In the present M. C. B. couplers the guard arm is sometimes a weak point. In many couplers it is practically a beam unsupported in its rear. It receives buffing blows at its outer end, and is required to carry them to its inner end, where it unites with the shank, and distribute them through the shank to the draft rigging. In the Hien coupler the guard arm is so constructed that it is supported immediately in the rear and forms a buffer which takes the blow in a straight line to the draft timbers and end sill. It is stated by the makers that 80 per cent of the breakages of all couplers is in the guard arm, caused by its being unsupported. By supporting and forming it into a buffer, as in the Hien, this breakage is expected to be reduced to a minimum.

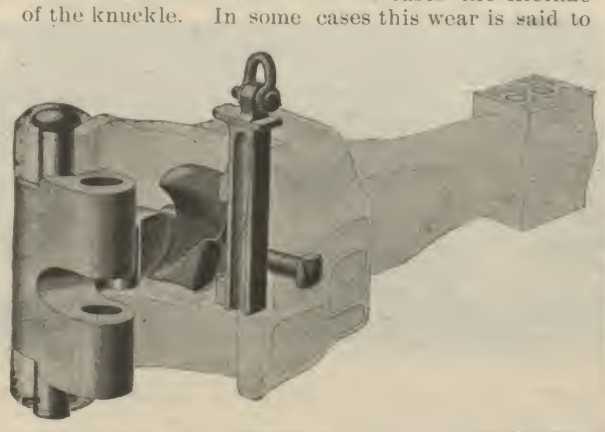


FIG. 2. THE HNIE COUPLER.

The general design and details have been thoroughly worked out. These couplers can be made of either malleable iron or steel. At present the shank, lifting pin and lock are made of malleable iron; the knuckle and pivotal pins of steel.

One of the main advantages claimed for this coupler is that whereby the time for operating is greatly reduced through the special features of the lock, in addition, also, should any portion of the lifting lever or chain broken, it is not necessary for the the yardman to go, between the cars and remain there while uncoupling.

The additional strength and correct distribution of the metal, together with the feature of receiving blows on the guard arm and transmitting them direct to the draft timbers, the concentration of all the delicate parts of the lifting lever into the locking device in the head, and the larger proportions of the coupler are expected to place this form in a relatively high position among couplers. It is placed on the market by the Railroad Supply Company of the Owings building, Chicago. Mr. D. S. Wegg is president, and Mr. Benj. Wolhaupter manager of the company.

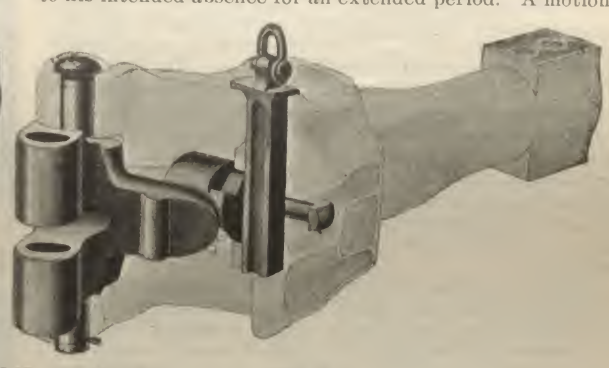


FIG. 3. THE HNIE COUPLER.

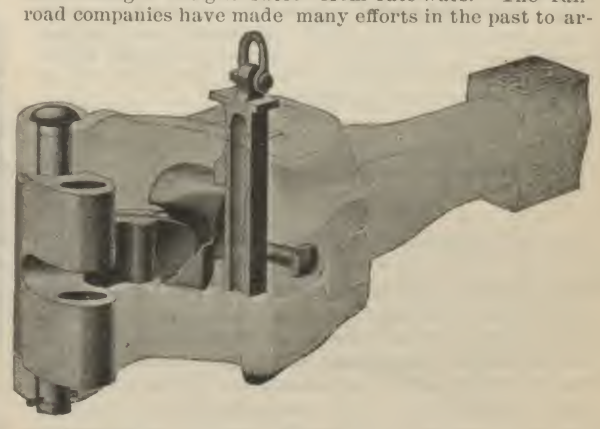


FIG. 4. THE HNIE COUPLER.

Western Society of Engineers.

At a board of direction meeting, held May 18, 1896, Mr. Henry Goldmark tendered his resignation as secretary, owing to his intended absence for an extended period. A motion was made and carried that he be excused from duty, salary and all responsibility, till August 1, 1896, and that Mr. Nelson L. Litten be appointed to act in his stead, and that notice of this change be sent to all members of the society

THE POOLING OF RAILWAY EARNINGS.*

BY J. H. REAGAN.

In the past much injury has resulted to the business, shipping, and industrial interests of the country, and much strife and loss of revenue to the railroad companies from the cutting of freight rates—from rate wars. The railroad companies have made many efforts in the past to arrest and prevent these mischiefs by the pooling of freights and the division of earnings. But as such contracts were not authorized or regulated by law, and rested on mere moral obligation, they were, as a rule, violated as soon as traffic managers found it to their interest to disregard them, and instead of remedying the evils they generally intensified the rate wars and aggravated their evils. Besides which, such pooling arrangements were so often made to contribute to the selfish interests of the corporations making them, and operated so unjustly on the interests of their patrons as to cause numerous appeals to congress to prohibit the practice. In answer to these appeals

*From a letter read at the convention of Railroad Commissioners, May 20.

the congress, in the fourth section of the act "to regulate commerce;" of Feb. 4, 1887, prohibited pooling; and in the same act provided that freight rates should be reasonable, and prohibited unjust discriminations between shippers. Heretofore, under rulings of the federal courts the Interstate Commerce Commission has found it difficult, if not impossible to enforce the law of 1887 "to regulate commerce" so as to carry out the purpose which congress had in view in its passage. And pooling and unjust discriminations less openly have gone on as before the passage of the law, though not so generally. And I understand that the purpose for which our committee was appointed was that they should report upon the question as to whether, as a means of preventing the evils herein mentioned, provisions of law should be made authorizing and regulating the pooling of freights and the division of earnings between railroads. In considering all questions of this kind two things should be kept constantly in mind and provided for. One, the protection of shippers against excessive rates and unjust discriminations; the other, the preservation of the necessary revenue to pay for the management and repairs of such railroads, and for reasonable interest on the value of the property of such roads, as far as the business on them will permit.

There is no doubt but that, in the competition for business, rates are often cut and thereby the revenues of the roads reduced, and that in doing this unjust discriminations are made, and this to an extent seriously affecting the interests of the railroads and of the public.

As to the commerce within the state of Texas, no such provision is necessary, because of the fact that by the law of this state the railroad commission of the state is authorized and empowered to make, regulate, and maintain the rates on state shipments of freight. And if congress would authorize and empower the Interstate Commerce Commission to make, regulate, and maintain rates on interstate shipments of freight, there would be no need of law or regulations governing pooling. In the absence of such a law, I have believed, and do believe, that the pooling of freights and division of earnings could be authorized by law and so regulated as to prevent, to a large extent, if not entirely, railroad wars and unjust discriminations in freight rates, with advantage both to the railroads and to shippers.

To accomplish this purpose all contracts for the pooling of freights or division of earnings on interstate commerce should by law be required to be submitted to and approved by the Interstate Commerce Commission. The difficulty in the past of enforcing compliance as between the railroads under such agreements grew mainly out of the fact that there was no legal penalty to be enforced for the violation of such agreement. In any effort to make such agreements effective it would be necessary to provide efficient penalties by law for their violation as between the contracting parties, and also to authorize the enforcement of such penalties by the proper officers of the government.

With such provisions as these added to the requirement that such agreements should be approved by the Interstate Commerce Commission before becoming effective, the public would be protected against excessive rates and unjust discriminations. Railroad wars and their bad effect, both on the interests of the general public and of the railroads, would be prevented, and the necessary revenues of the roads would be preserved as far as the business on them would be sufficient for that purpose.

To authorize the pooling of freights and the division of earnings by the railroads, without the limitations above mentioned, would be to sanction the restoration of the abuses and wrongs which caused congress to adopt the fourth section of the act to regulate commerce.

If the policy above indicated could be adopted and carried out in good faith, it would certainly do much toward arresting and preventing the enormous amount of deceit and fraud which so often characterize the conduct of freight agents and traffic managers, and which do so much toward demoralizing the public by causing each shipper to fear that his competitor in business is getting better rates than himself, and thus tempting him to seek rates which would be unjust to others.

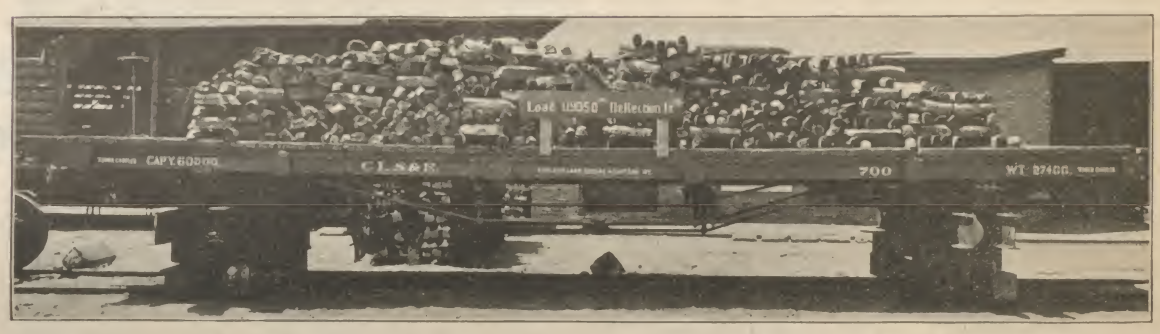
TWO STRONG STEEL CARS.

In the discussion of the large car problem before the New York Railroad club recently Mr. A. M. Waitt, general master car builder of the Lake Shore & Michigan Southern railroad, said: "Eventually I think steel will take the place of wood in the construction of the floor frame of railway cars to a great extent. When this day comes it may be that cars can be constructed within reasonable limits of weight that will warrant increased capacity without increased depreciation or too high ratio of dead load to paying load." There are unmistakable signs that steel car construction is coming rapidly forward, and is to assume such a form as to compel the attention of railway officers. Much of the necessary preliminary work has already been done, and records are at hand of sufficient length of service to justify drawing conclusions which are highly favorable to this material when used in proper designs. Through the courtesy of Mr. W. R. Stirling, president of the Universal Construction Co. of the Rookery, Chicago, we are enabled to illustrate and describe some interesting tests which have recently been made upon two types of steel cars by loading them with pig iron. These loads were placed on the cars on Saturday, May 23, and at the time of going to press they were still in the position shown in the accompanying illustrations, which were made from photographs.

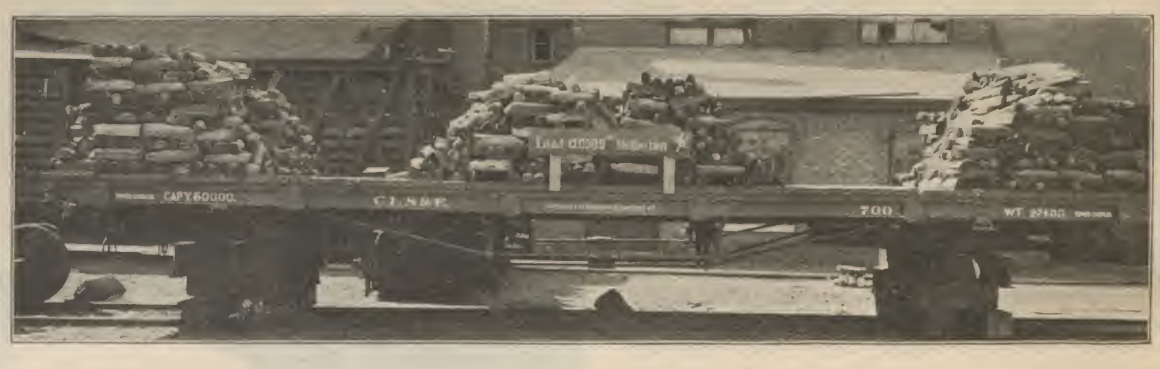
In 1892 the Harvey Steel Car Company constructed cars with metal under-frames under the patents of George L. Harvey. Some of these cars were sold to the Calumet & Blue Island Railroad.

One of them, a flat car, with the usual wooden floor, but the under-frame made of channels connected on the plan of the Harvey patents, as illustrated in the RAILWAY REVIEW of Jan. 7 and June 10, 1893, was put into excessively severe service, and is reported to have made over 60,000 miles between July, 1892, and the present time. When in the yards of the Illinois Steel Company this car has received excessive loads, it being a well-known fact that the men who handle pig iron from blast furnaces do not measure the amount they place upon the car; neither do they carefully distribute the load. An examination of the needle beams shows also that the car has received some pretty serious blows in switching in the yard, the steel needle beams being somewhat distorted.

This car is now in the yards of the Universal Construction Company at their works on Waubansia avenue, Chicago, and has been subjected to tests that might perhaps be expected to be applied to a new car, but which this car has stood without any signs of weakness. The first test was a load of 119,050 lbs. of pig iron, as shown in Fig. 1, placed between the bolsters, giving a deflection of 1⅛ in. A load of 120,000 lbs. was then distributed, as shown in Fig. 2, about equally between the two ends and the center, and the car recovered so it showed only a ½ in. deflection, at the center and ¼ in. at the ends, with the weight so distributed. This proves that



HARVEY STEEL CAR—FIG. 1.—LOAD 119,050 LBS.



HARVEY STEEL CAR.—FIG. 2.—LOAD 120,000 LBS.

PENNOCK STEEL CAR—FIG. 3.—LOAD 126,420 LBS.

PENNOCK STEEL CAR—FIG. 4.—LOAD 140,000 LBS.

PENNOCK STEEL CAR—FIG. 5.—LOAD 159,200 LBS.

the elastic limit of the metal had not been reached in spite of this excessive load, and when the load was taken off the car returned to its normal position.

Mr. W. G. Brimson, president of the Chicago, Lake Shore & Eastern, which is the successor of the Calumet & Blue Island, reports in January, 1893, the purchase of 30 box cars and 20 stock cars built on the Harvey design, which have been kept in continuous service in the coke trade of the Illinois Steel Co. since that date. Three of these cars have been in wrecks, but were repaired without much difficulty and have been in service ever since. All of the cars have made good records, and so far as Mr. Brimson's road is concerned have not cost a dollar for repairs. It is a fair supposition that the experience of the roads on which these cars have run must have been similar to that of the Calumet & Blue Island, for the reason that these cars have made a considerable greater mileage during that period than wooden cars in the same service and running in the same trains, showing conclusively that the Harvey cars have not been side-tracked for repairs; and it is fair also to presume that if they had been side-tracked and if any special difficulty had been experienced in making repairs, the receiving roads would have complained and called attention to that fact. The cars in question have run over the trunk lines carrying the coke from the Connellsville and Pocahontas regions to Chicago.

The question may naturally be raised as to why has so little been heard of the Harvey cars in the last three years, and how is it that the Harvey Steel Car Co. failed to make a success of cars that can make such a record as is given above. The answer may be found in the fact that the Harvey Steel Car Co. was developed in an industry connection with the building up of the town of Harvey. The managers of the car plant were so occupied with the business of developing the town of Harvey that car construction became a mere side issue, and, as a result of the panic of 1893, the company finally came to grief and passed into the hands of a receiver. The Universal Construction Co., which has recently been incorporated for manufacturing structural steel and material for bridges, metal cars and other structures, has secured control of the Harvey patents and is now prepared to build cars at their works. An examination of the Harvey cars—box, stock, flats and gondolas—shows that bolts, nuts, rivets, keys and cotters, covering the method of fastening employed by Mr. Harvey in his form of construction, remain practically in their places and keep the car in entirely satisfactory condition, contrary to what might be the anticipation of master mechanics and others that they will be a source of trouble from loosening while in service. While the Harvey car is undoubtedly a good one and has endured severe service, yet as already stated, it embraces the old form of construction in that it has a wooden floor. The use of metal is confined to its substitution in the under frame for wood sills and framing. Mr. Willard Pennock, of Minerva, O., for many years a car builder with a good reputation for his product, is the only man so far as we know who has taken a radical step forward and abandoned the old rules of car construction, has designed a car on which patents have been issued and other patents applied for, in which the floor and sills are integral parts, the one of the other, being formed of plates rolled cold in a rolling machine of Mr. Pennock's design, so that the plates form channels of lighter weight and deeper flanges than can possibly be manufactured in the ordinary form of channel in any rolling mill that has yet been designed. This construction was illustrated in the RAILWAY REVIEW of Nov. 23, 1895, page 650. The control of this car has also been secured by the Universal Construction Co., whose officers believe that the demands of progressive railroad managers in the near future will call for cars, either with metal under frames or entirely of metal construction. Mr. Pennock built a car in May, 1895, which was sent to the works of Carnegie Steel Co., in Pittsburgh, and was used in transporting pig metal about the works. While there it underwent a severe test of which Mr. Morrison, general superintendent, wrote as follows:

> We loaded a scull on this car weighing about 50 tons, and on account of the bulk we had to load the scull on one end of the car, and in order to make the scull clear the side of the cast house, the scull had to be loaded on one side of the car. The weight all being on one side and one end, caused a side bearing to break. In placing the car to be unloaded, a rail broke which caused the car to drop off the track and brake the yoke. Altogether it will cost about $10 to repair the car. However, I consider that the car has done exceeding well in this instance, and we are very much pleased with it.

After this Mr. Pennock sent the car to the works of the Universal Construction Co., which has been subjected to the following tests:

1. A load of 126,400 lbs. of pig iron between bolsters, giving a deflection of 1 in.,—shown in Fig 3.
2. A load of 140,000 lbs. between bolsters with a deflection of 1⅛ in.,—shown in Fig. 4.
3. A load of 159,200 lbs.—shown in Fig. 5—distributed about 45,000 lbs., at each end, and 69,000 lbs. in the center, showing a deflection of ¼ in. at one end ⅜ in. at the other, ⅝ in. at the center.

The car therefore recovered from the 1⅛ in. deflection with the excessive center load to only ⅝ in. deflection with the reduced center load, showing again that the elastic limit of the metal had not been reached. Of course all these cars in these test had to be placed upon metal beams, as no trucks would stand such a load. The observations were taken with a surveyor's level at a number of points on the car and observed with the greatest care and accuracy.

Among other advantages that are claimed for the Pennock car are these:

1. That the draft rigging can be placed between the center sills, thereby being made continuous and obviating the attachment of draft timbers below the center sills, which always have been a source of frequent accidents and expensive repairs.
2. All the sills and the flooring are integral parts, the one of the other, obviating the boring of holes and bolting together of the timbers of the floor, as is necessary in the wooden car construction.
3. The plates that form these sills and floors are bolted and riveted together close under the floor at points where the least possible injury is done to the metal, and the flanges upon which dependence is put for bearing these great loads are in no way destroyed by the cutting or drilling.
4. The metal floor will stand the abrasion of coal, stone, ore, gravel, pig iron and all forms of rough material with, one might say, an infinitesimal loss of the metal, whereas in the case of wood this abrasion immediately begins to depreciate the car and, as is readily understood, requires the replacement of the floor after a very few years of such service.

INDICATOR DIAGRAMS AS AFFECTED BY LONG PIPE CONNECTIONS.*

W. F. M. GOSS.

The excellence of the modern steam engine indicator, and a growing appreciation of its value, have operated in recent years greatly to extend its use. It serves the designer of a proposed engine by disclosing to him the performance of those already existing, its aid is a guide in the adjustment of the new engine, and its record is an important factor in a determination of the power and efficiency of the completed machine. The record of the indicator is, also, often accepted as conclusive in the settlement of important matters of business, and in the development of interesting questions in science. It is well, therefore, that every condition affecting its accuracy be known and appreciated.

It is commonly assumed that any one understanding the action of the indicator, is competent to apply it and to interpret the results which it gives; and it is true that, viewing the instrument as an educational means, its widest use is justifiable. But reliable results with the indicator are not obtained by chance, nor by dependence upon fine mechanism alone, but rather by an intelligent application of the instrument and by watchful and painstaking manipulation. As has been said of liberty, so it may be said of reliable indicator cards—their price is "eternal vigilance." In general, one is not justified in accepting a diagram as a basis for safe conclusions unless very much more is known about it than the information given by its outline.

Errors in indicator diagrams may arise from several causes, one of which is the pipe connecting the indicator with the engine cylinder. It is admitted that, under the conditions of ordinary practice, the presence of the pipe does not constitute the most prolific source of error, but it can be shown that it does cause serious distortion in the form of the diagram, and it is believed that this fact merits more careful consideration than has heretofore been accorded to it. The writer has already called attention to the fact that in road tests of locomotives, where the indicator is attached to a length of pipe sufficient to bring the instrument to the top of the valve box (a length of 3½ feet or more), a true card can be obtained only at slow speeds; and has shown that, for a speed of 300 revolutions per minute, the diagram is likely to be in error as much as 17 per cent. These early experiments were further used as the basis of a discussion concerning the precise character of the influence exerted by the pipe. They have now been followed by a more extended series of experiments, the results of which are herewith presented.

All experiments were made in connection with a 7¾ in. by 15 in. Buckeye engine. The power of this engine was absorbed by an automatic friction brake, by means of which a very constant load was obtained. The head end of the engine cylinder was tapped with two holes (*a* and *b*, Fig. 1), both in the same cross section, and hence equally

*Abstract of paper read before the American Society of Mechanical Engineers.

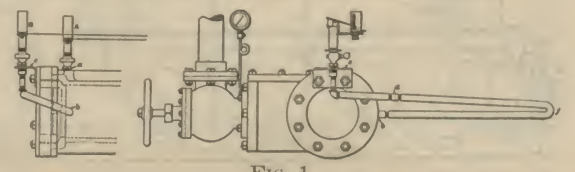
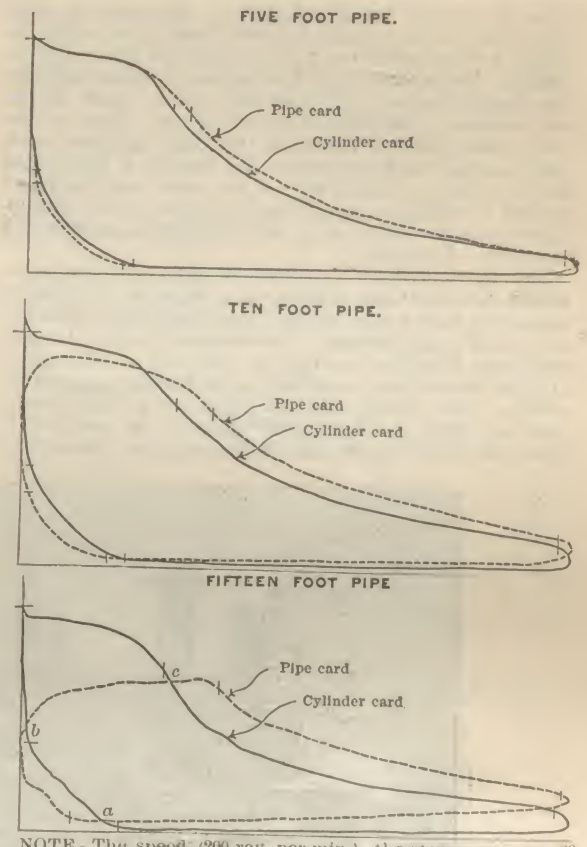


FIG. 1.



NOTE - The speed (200 rev. per min.), the steam pressure (80 lbs.) and the cut-off (approximately ½ stroke), were constant for all diagrams.

FIG. 2.—INDICATOR DIAGRAMS.

exposed to the action of the steam in this end of the cylinder. One of these holes *a* was made to serve for the indicator A, the cock of which was placed as close to the cylinder as possible. The hole *b* was made to receive one end of the U-shaped pipe, the other end of which entered a coupling fixed in the angle plate *c*. The cock of a second indicator, B, was screwed to this coupling. A single system of levers supplied the drum motion for both indicators. The closely-connected indicator, A, will hereafter be referred to as the "cylinder indicator," and the cards obtained from it as "cylinder cards." It is assumed that this indicator recorded the actual conditions of pressure existing in the cylinder. In like manner the indicator, B, will be referred to as the "pipe indicator," and cards obtained from it as "pipe cards." It is assumed that this indicator gave a record which, when compared with that given by the cylinder indicator, demonstrated the effect of the pipe.

Test Number.	No. of Figure Representing Diagram.	Apparent Cut-off. Excess Shown by Pipe Diagram.		Pressures. Excess.(+) or Deficiency (–) Shown by Pipe Diagram.								Steam Consumption per Horse-power per Hour. Excess (+) or Deficiency (–) as Shown by Pipe Diagram.	
				At Cut-off.		At Release.		At the Beginning of Compression.		M. E. P.			
		Per Cent. of Stroke.	Per Cent. of Cyl. Cut-off.	Pounds.	Per Cent.	Pounds.	Per Cent.	Pounds.	Per Cent.	Pounds.	Per Cent.	Pounds.	Per Cent.
1	2	3.0	11.5	–1.3	–2.2	0.0	0.0	–0.1	–5.6	+1.2	+3.7	–0.1	–0.5
2	3	6.8	24.3	–2.8	–4.8	+2.1	+18.0	+0.2	+9.2	+2.7	+8.5	–0.4	–1.7
3	4	10.0	38.4	–5.1	–9.8	+6.5	+57.7	+4.0	+200.0	–1.5	–5.0	+11.7	+45.9
4	6	4.0	16.6	+1.1	+2.0	–0.5	–3.7	+0.1	+6.0	+3.0	+8.8	–2.0	–7.2
5	7	7.5	27.7	–2.8	–4.8	+2.1	+18.0	+0.2	+9.2	+2.2	+6.6	–0.4	–1.7
6	8	6.8	26.7	–3.9	–5.7	+2.8	+24.8	–0.3	–9.0	+5.3	+18.7	–1.0	–4.2
7	9	3.3	23.4	+3.5	+6.7	0.0	0.0	0.0	0.0	+6.5	+35.8	+11.5	+47.9
8	10	7.0	25.9	–2.8	–4.8	+2.1	+18.0	+0.2	+9.2	+4.2	+12.8	–0.4	–1.7
9	11	2.3	6.5	+6.0	+10.3	+3.0	+18.2	+1.0	+50.0	+1.4	+3.4	–6.8	–23.6

All percentage values are based on results from cylinder-diagrams. For example, in test No. 4 the pressure at cut-off shown by pipe-card is 2 per cent. in excess of that shown by the cylinder or true card; the pressure at release by the pipe-card is 2.7 per cent. less than by the true card; the pressure at the beginning of compression by the pipe-card is 6 per cent. greater than by the true card; and the mean effective pressure by the pipe-card is 8.8 per cent. greater than by the true card.

The pipe fittings were all half-inch. A right-and-left coupling at *d* allowed the U-shaped section *d*, *f*, *b*, to be removed at will and replaced by a similar section of different length. Pipe lengths of 5, 10 and 15 feet were used, length being measured from the outside of the cylinder wall to the end of the coupling under the cock of the pipe indicator. The pipe and fittings were covered first with a wrapping of asbestos board, next with three-eighths of an inch of hair felt, and finally with an outside wrapping of cloth. It is to be noted that the bend in the pipe at *f* is easy, and that there is a continual rise in the pipe in its course from the cylinder to the indicator. Both indicators were always well warmed before cards were taken. A gage between the throttle and the valve box was useful as an aid in securing constant pressure within the latter. In the tests herein described, however, the boiler pressure was kept constant as nearly as possible, and the throttle was generally "full open."

A pair of new Crosby indicators was set apart for this work, and while it will be shown that the value of the comparisons which were undertaken is not dependent upon a high degree of individual accuracy in the indicators, these instruments, when calibrated under steam, gave results which were nearly identical.

The results, which are represented in the form of diagrams (Figs. 2, 3 and 4), were obtained in the following manner:

The engine having been run for a considerable period and the desired conditions as to pressure, speed, and cut-off, having been obtained, cards were taken simultaneously

from the cylinder and pipe indicator. Two pairs of cards were thus taken as rapidly as convenient, after which the position of the indicators was reversed and the work repeated. There were thus obtained four cylinder and four pipe cards, one-half of each set having been made by one and one-half by the other of the indicators. Next, by the use of closely drawn ordinates the eight cylinder cards were averaged and combined in the form of a single card and the eight pipe cards were in the same way combined to form a single pipe card. The two typical cards thus obtained, superimposed as in the illustrations, constituted the record of the test.

The effects produced by the use of pipes between the indicator and the engine cylinder of 5, 10 and 15 ft. in length are shown in the illustrations, the speed, steam pressure and cut-off being constant. By reference first to the upper figure, it will be seen that the effect of a 5 ft. pipe is to make the indicator attached to it a little tardy in its action. Thus, during exhaust, when for a considerable interval of time the change of pressure to be recorded is slight, the lines from the two indicators agree; but during the compression which follows, the loss of sensitiveness in the pipe indicator is made evident by its giving a line which falls below the corresponding line traced by the cylinder indicator. Similarly, during admission there is an approximate agreement, while during the expansion which follows, the lagging of the pipe indicator results in a line which is higher than the expansion line given by the cylinder indicator. As a result of this lagging in the action of the pipe indicator, its card is in error in the location and curvature of the expansion and compression curves; also in the location of the events of the stroke, and in the area which it presents. The speed at which these errors are shown to occur is moderate (200 revolutions), and the length of pipe attached to the indicator is not greater than is often used.

The general effect of a 10 ft. length of pipe is the same with that of the shorter length, but the lagging action due to the pipe is more pronounced, and all errors are proportionately greater. In this case, also, the admission and exhaust lines fail to agree, the total range of pressure recorded upon the cards being less than the range existing in the cylinder.

A still further addition to the length of the pipe brings changes into the form of the pipe card diagram which, while entirely in harmony with those already discussed, are of such magnitude that the form of the card loses some of its characteristic features. The admission and expansion lines are lower, and the exhaust line is higher, than are the corresponding lines for the true card. While cards from pipes of 5 and 10 feet in length present an area greater than that of the true card, the card from a 15 ft. length of pipe makes the area less.

It is true that the lengths of some of the pipes experimented with are excessive as compared with those commonly used for the connection of indicators, but this fact does not deprive the results of their significance. If pipes of 15, 10 and 5 feet in length will produce the effects shown it is but reasonable to suppose that pipes of less than five feet in length will produce some effect. And, since the effect of a 5 ft. pipe is considerable, this length must be greatly reduced before the effect ceases to be measurable.

Differences of speed have less effect than would be supposed in modifying the form of the pipe card; and even with a speed as low as 100 revolutions per minute, the effect of the pipe is strikingly apparent. The point of cut-off chosen for the whole series now under consideration, is not especially favorable for showing the modifying effect of the pipe. These considerations, together with the fact that indicator pipes of three and four feet in length are not uncommon, all serve to emphasize the practical value of the effects noted.

The effect produced by the several pipes upon the clearance of the engine, is given below:

Cylinder and port clearance, per cent of piston displacement	4.08
Clearance due to 5 ft. pipe, per cent of piston displacement	2.69
Clearance due to 10 ft. pipe, per cent of piston displacement	5.14
Clearance due to 15 ft. pipe, per cent of piston displacement	7.84
Total clearance with 5 ft. pipe in place, per cent of piston displacement	6.77
Total clearance with 10 ft. pipe in place, per cent of piston displacement	9.22
Total clearance with 15 ft. pipe in place, per cent of piston displacement	11.

CONCLUSIONS.—The following conclusions constitute a summary of the data already presented:

1. If an indicator is to be relied upon to give a true record of the varying pressures and volumes within an engine cylinder, its connection therewith must be direct and very short.

2. Any pipe connection between an indicator and an engine cylinder is likely to affect the action of the indicator; under ordinary conditions of speed and pressure, a very short length of pipe may produce a measurable effect in the diagram, and a length of three feet or more may be sufficient to render the cards valueless except for rough or approximate work.

3. In general, the effect of the pipe is to retard the pencil action of the indicator attached to it.

4. Other conditions being equal, the effects produced by a pipe between an indicator and an engine cylinder become more pronounced as the speed of the engine is increased.

5. Modifications in the form of the diagram resulting from the presence of a pipe, are proportionally greater for short cut-off cards than for those of longer cut-off, other things being equal.

6. Events of the stroke (cut-off, release, beginning of compression) are recorded, by an indicator attached to a pipe, later than the actual occurrence of the events in the cylinder.

7. As recorded by an indicator attached to a pipe, pressures during the greater part of expansion are higher, and during compression are lower, than the actual pressures existing in the cylinder.

8. The area of diagrams made by an indicator attached to a pipe, may be greater or less than the area of the true card, depending upon the length of the pipe; for lengths such as are ordinarily used, the area of the pipe cards will be greater than that of the true cards.

9. Within limits, the indicated power of the engine is increased by increasing the length of the indicator pipe.

10. Conclusions concerning the character of the expansion or compression curves, or concerning changes in the quality of the mixture in the cylinder during expansion or compression, are unreliable when based upon cards obtained from indicators attached to the cylinder through the medium of a pipe, even though the pipe is short.

NEW EIGHT-WHEEL PASSENGER LOCOMOTIVE. C. R. I. & P. RAILWAY.

The Chicago, Rock Island & Pacific railway has just completed a fast passenger locomotive of the eight-wheel type in its Chicago shops, from designs by Mr. George F. Wilson, superintendent of motive power and equipment, and through the courtesy of Mr. Wilson and Mr. S. F. Boyd, assistant general passenger agent, we are enabled to illustrate and describe the design. The locomotive is intended specially for high speed service upon the Illinois division of the road which is now being operated by heavy ten-wheel engines. So far as can be learned there is no fault found with the ten-wheeled locomotives, but the new design is expected to perform the same service and produce higher speed if necessary with greater economy. The general appearance of the engine, as will be seen from an examination of Fig. 1, which is taken from a photograph, embodies no new or radical ideas, but is simply a well considered arrangement of features in locomotive construction which have been found satisfactory. It is a good design, giving a large amount of steam space, free steam passages, and high boiler power. The cylinders are 19½x26 in., and it is highly probable that unusual power will be developed, for which definite information will be sought by those who have recently undertaken the production of high speed locomotives. The appearance of the engine is so symmetrical as to give no idea in the photograph of its large size, and all appearance of monstrosity is concealed by the proportioning of the parts and fittings.

The boiler is of the extended wagon top radial stay type, and was received from the Brooks Locomotive works. The fire box is between the frames, sloping downward from the rear axle as shown in the outline sketch Fig. 2. The driving wheels are 72 in. in diameter over the centers and 78 in. over the tires. The centers are of cast steel, and are shown in detail in Fig. 3. This illustration also shows the cast iron disc, which is let into the wheel hub for a bearing surface against the boxes. This disc is 19½ in. in diameter and ⅝ in. thick. The patterns for the wheels were made from Mr. Wilson's design. The bearing surfaces of the driving boxes, which touch the wheel hubs, are babbitted, as are also the sides of truck boxes. The driving boxes are of steeled cast iron with bronze and babbitt strips, the journals being 9x12 in. Cast steel is used for driving wheels, lifter shaft, rocker arms and cross heads. The cross heads are of the alligator type, with a bearing length of 24 in. and a width of 6½ in. on the guides, which are of cast iron and very heavy. The dry pipe is 8 in. in diameter, and special attention has been given to admit of easy passage of the steam to and from the cylinders. The cylinders are provided with air spaces, which separate the steam passages from the outside of the castings, and the chests and heads are provided with magnesia covering for insulatian against radiation. The nozzle now in use is 5 in. in diameter, and as the engine has steamed freely with this in freight service, it is the intention to enlarge it somewhat. The dome cap is designed to be as low as possible to admit of the large size of the back end of the boiler.

The valves are of the Richardson balance type and are open upon the top. For the large size they are light, weighing but 161 lbs. each. The steam ports are 1½ x 20 in. and the exhaust port 3½ x 20 in. The throw of the eccentrics is 6 in., whereas 5½ in. was the maximum heretofore used on this road. The maximum travel of the valve is also 6 in. The Pennsylvania balance plate, with one bearing surface, is used, against which the plate is drawn by means of a single large nut. The relief valves are attached to the steam chest in the usual manner, and the chest cover is provided with a loose piece under the pipe which admits of removing the cover with-

NEW FAST PASSENGER LOCOMOTIVE—C., R. I. & P. R. R.—FIG. 1.—GENERAL VIEW.

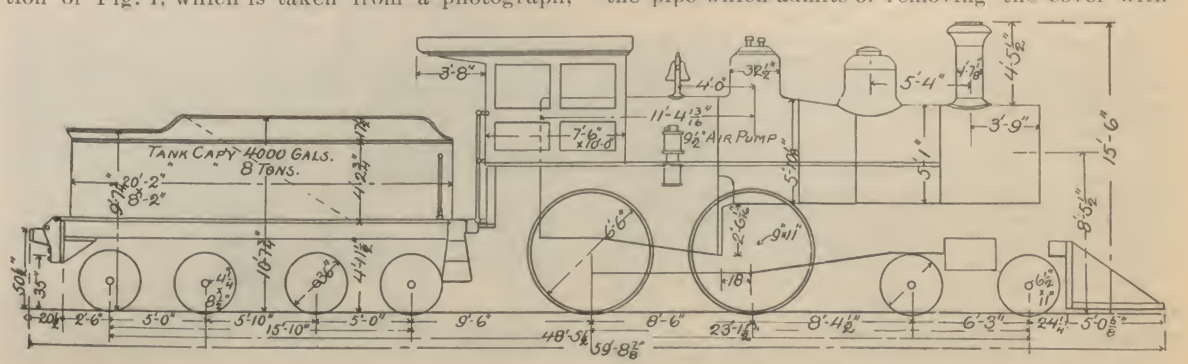


FIG. 2.—DIAGRAM SHOWING PRINCIPAL DIMENSIONS.

out unscrewing the connection. The cab is 7 ft. 6 in. long by 10 ft. in width, and is so arranged as to give the engine crew as much space as possible therein, and is the largest in use on the road. The hand holes and steps are convenient and arranged with special reference to the safety of the men, that upon the cab side being unusually long. The engine truck is the standard for eight and ten-wheel engines, but is reinforced where necessary for the high speed service. The wheels are 36 in. in diameter, with cast iron spoke centers, and Krupp tires. The The journals are 6½ x 11 in. The Westinghouse air brake is provided for tender, driving and truck wheels. The American driver brake is used. The engine is fitted with two Monitor No. 10 injectors and with a steam bell-ringer. The eccentric straps are of brass, weighing 90 lbs. per pair, and these are illustrated in Fig. 6. This form of eccentric strap has been used upon this road for about three years, and has been found entirely satisfactory under the severe conditions which are imposed by sand on the western portions of the line as well as the less severe conditions existing elsewhere. They are now in use upon about one hundred locomotives and have been adopted as standard, after a number of trials of other material, such as babbitt.

The tender has a tank capacity of 4000 gallons and a coal capacity of 8 tons. Its chief dimensions are given in Figs. 2 and 4, the latter giving the details of construction and the method of staying and bracing by means of angle irons. The back and upper sides of the coal space are in the form of a hopper which brings the coal automatically to the front of the tank. The coaming at the top of the hopper is 23 in. high and immediately back of the coal space is a large open deck on top of the tank for carrying tools. The man-hole is in the form of an elipse 16 x 36 in. Drainage is provided for the back end of the tank by means of two cast iron pipes. The coal gates are similar to those used on the Atchison, Topeka & Santa Fe Railway.

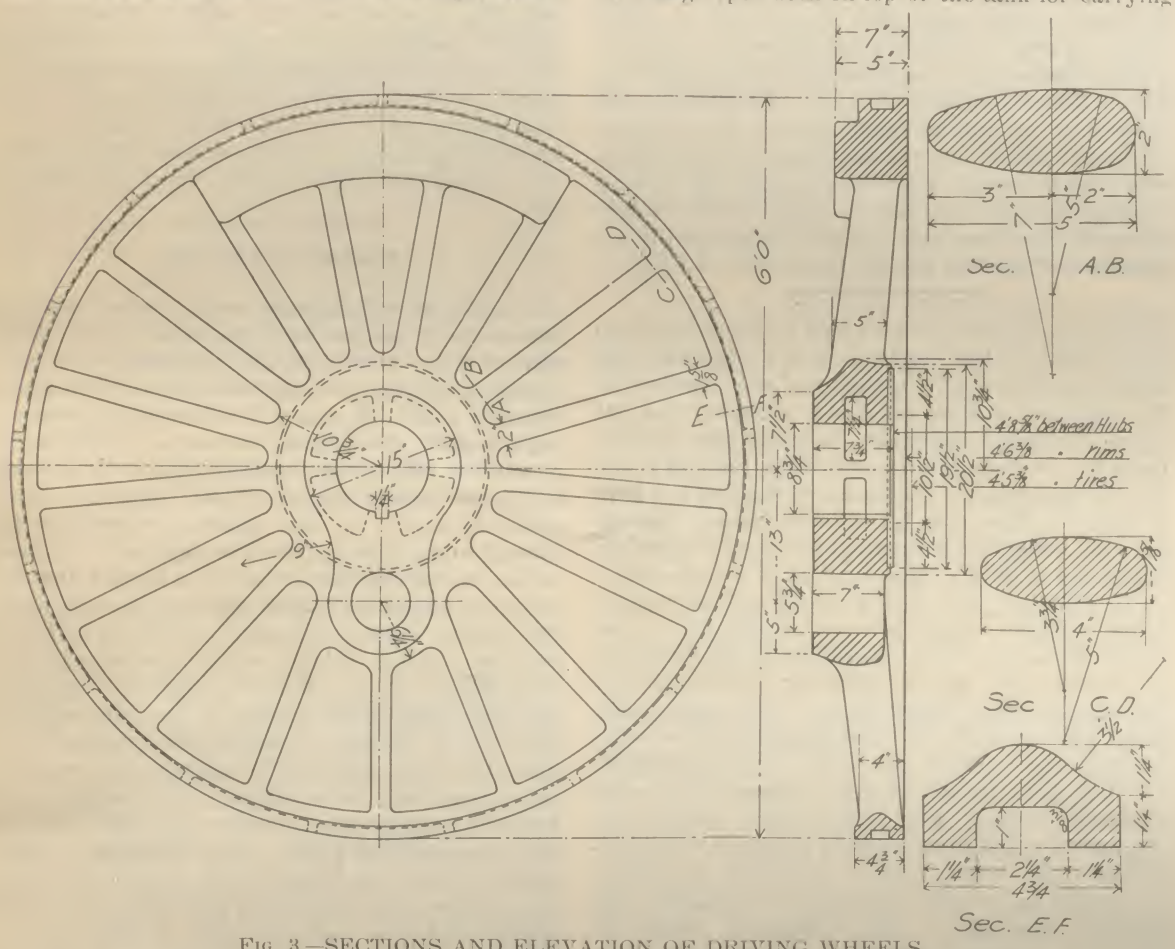


FIG. 3.—SECTIONS AND ELEVATION OF DRIVING WHEELS.

The leading dimensions and weights of the engine are as follows:

Cylinders	19½x26 in
Driving wheel centers	72 in
Diameter of boiler	61 in
Diameter of back head of boiler	71⅛ in
Fire box, length	9 ft
Fire box, width	2 ft. 8⅜ in
Fire box hight, front	6 ft. 7¾ in
Flues, outside diameter	2 in

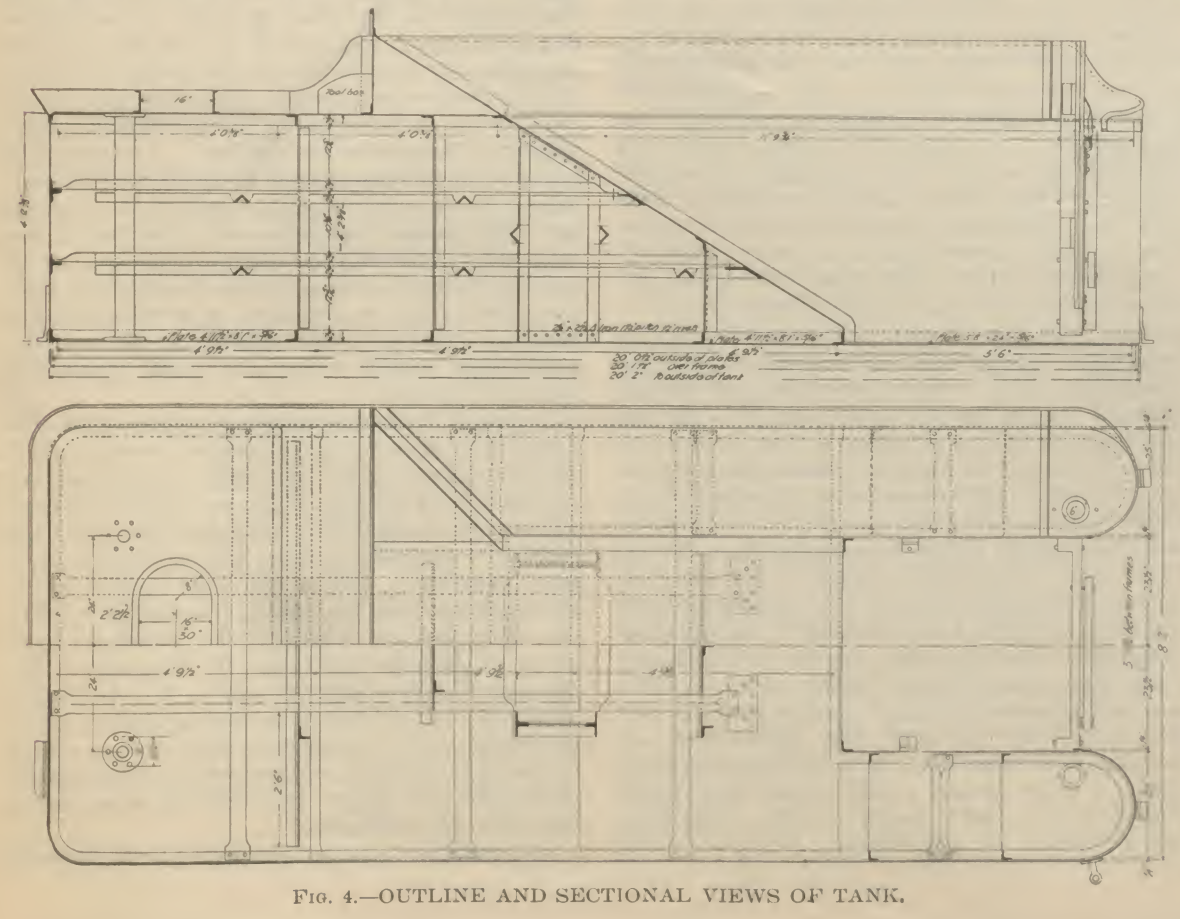


FIG. 4.—OUTLINE AND SECTIONAL VIEWS OF TANK.

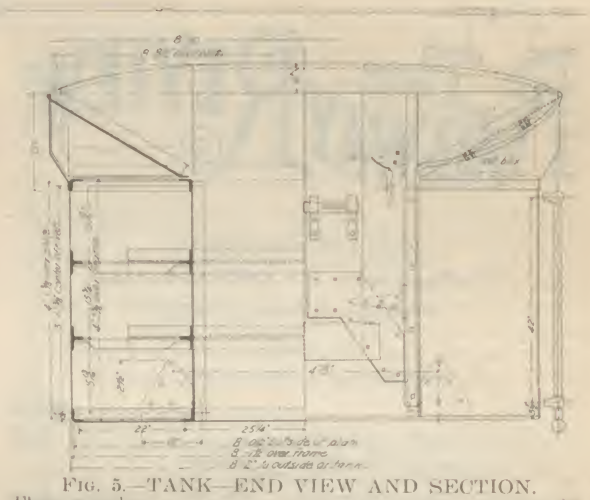


FIG. 5.—TANK—END VIEW AND SECTION.

Flues, number	296
Flues, length	11 ft. 7 in
Boiler pressure	190 lbs
Grate surface	24.5 sq. ft
Heating surface, in tubes	1795 sq. ft
Heating surface, in fire box	193.3 sq. ft
Heating surface, total	1988.3 sq. ft
Steam ports	1½x20 in
Exhaust ports	3½ x 20 in
Travel of valve	6 in

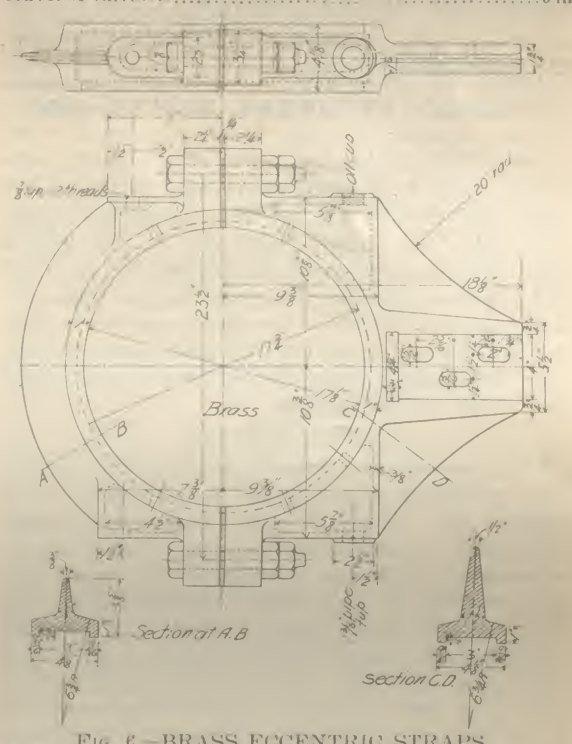


FIG. 6.—BRASS ECCENTRIC STRAPS.

Eccentric throw	6 in
Outside lap	1⅛ in
Inside lap	0
Hight top of rail to top of stack	15 ft. 6 in
Hight top of rail to center of boiler	8 ft. 5½ in
Total weight of engine	125,000 lbs
Weight on driving wheels	83,000 lbs
Weight on truck	42,000 lbs
Weight of tender, loaded	78,000 lbs
Driving wheel base	8 ft. 6 in
Length of frames	30 ft 9¾ in

Dange· From Underground Electric Conduits

A circular issued by the Boston Manufacturers' Mutual Fire Insurance Co. describes a remarkable case of a house in Boston which was set on fire in three places at the same time by electric currents, although there were no electric lightin ;t or other strong electric currents used in the building. There was a three-wire Edison conduit in the street, and it appeared that the current escaped from the conduit into a near-by gas pipe, ran into the house by the gas service pipes and jumped from them to the water pipe, by which it returned to the street and was grounded. The circular says:

On Nov. 28, a fire was found burning between the ceiling of the kitchen and the floor above. At about the same time, a second fire was discovered a few feet distant, and then a third appeared beneath a set bowl in the bath room. All of these fires were in the vicinity of gas or water pipes.

The accident is explained as follows: An Edison underground conduit ran through Walnut St. This conduit is an iron pipe containing three copper conductors, one positive, one negative and one neutral, separated from each other and the pipe by an insulating compound. There is about 110 volts difference in potential between the neutral and the other two conductors.

In Boston the neutral wire of the Edison Co., is grounded—this means that there was a complete circuit from the point where the insulation had failed, to the ground, by way of the conduit pipe, thence through the gas service pipe, thence along the gas piping in the house to the water pipe system, through various contacts; thence through the water pipe system out of doors to the underground network of water pipes, which would furnish a good ground. This means direct connection from one side of the system through the house to the neutral wire, it being at the same potential as the ground. The fires were started by the current forming arcs as it jumped from one system of pipes in the house to the other system.

Without venturing to suggest the best remedy for all such possible accidents, it may be interesting to note that in this case a connection by a large wire between the service pipes, located preferably just outside the wall would have obviated the trouble inside of the building. There were one or two other cases of similar troubles reported in Boston during the past year.

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CHICAGO, SATURDAY, MAY 30, 1896.

WE publish in this number the full text of the decision of the U. S. Court of Appeals in the case of the Gould Coupler Co. vs. the Trojan Car-Coupler Co., which was handed down May 27. As will be seen, the opinion reverses the decision of Judge Coxe and dismisses the injunction proceedings. The opinion is received too late to permit of a careful review, and is given to our readers without comment in order that they may be fully advised of the facts in the case at the earliest moment.

THE iron and steel industry is at a low ebb, so low that possibility of a reaction is beginning to be watched for. Agents of mill interests have spent considerable time digging deep into probabilities by ascertaining, as far as possible, the intentions and plans of those who have large enterprises under way or in contemplation. Manufacturers who have investigated are of opinion that an early improvement in demand is probable. The structural mills are now quite busy, and a marked improvement means an advance in prices for early deliveries. Consumers are still awaiting an expected crisis in steel billets Stocks of pig iron are 300,000 tons larger than six months ago, but consumption and production are more nearly equal than for a long time. It will require only a moderate demand to harden prices all around.

THE political economy club of the University of Chicago were favored on Thursday evening of the current week with an address by the Hon. Martin A. Knapp, of the Interstate Commerce Commission. Mr. Knapp outlined in an entertaining as well as convincing way how the development of railroad transportation had revolutionized the industrial economics of the country, and that while competition, so long as it was modified and circumscribed by the cost of transportation over long distances, could not injure and might in some degree stimulate trade, the possibilities of present methods, by which distance was annihilated, had altogether changed the situation, and made competition very often a menace to, if not the death of, trade. Inasmuch as it is hoped to publish this address in full in the near future no extended review will now be made.

THE advisability of holding the annual conventions of the railroad commissioners of the United States at some other place than Washington was, as suggested in our issue of last week, perceived by that body at their recent meeting, and, as a result, St. Louis was selected for next year's convention. If, in addition to the advantages to be gained by an annual change of the place of meeting should be added the securing of two or three addresses from prominent railway men, and the publication in advance of their names and the subject of their address, a larger attendance would undoubtedly be secured. It is true that at the recent convention Mr. A. C. Bird, of the Chicago, Milwaukee & St. Paul road, was present, and Messrs. Stickney and Clough sent papers to be read, but the fact was not announced in advance and no one was attracted thereby. If at the next convention the attendance of such men as M. E. Ingalls, of the Cleveland, Cincinnati, Chicago & St. Louis railway, and H. S. Haines, of the Southern Railway Association, could be secured, it is probable that not only would the attendance of the railroad commissioners themselves be increased, but quite a number of other railroad men would doubtless be present and take part in the discussion. The possible benefits of this yearly meeting are altogether too great to allow it to be either discontinued or become perfunctory. Not only is the interchange of experience and ideas between railroad commissioners themselves a valuable feature, but the meeting of these gentlemen with prominent representatives of the railroad interests and the free discussion which will be promoted thereby, would do much to harmonize the antagonisms which are now too frequently manifest.

THE losses of power which may be introduced into steam plants by the employment of shafting are not always possible of elimination, and are therefore to be considered in many cases as a necessary evil, yet there is sufficient reason for believing that in many cases the losses might be somewhat reduced if the fact of the frictional resistances of shafting was kept in mind by those who lay out shop plants. In a paper read before the American Society of Mechanical Engineers at the St. Louis meeting of last week, Mr. A. H. Eldredge described a test of a four-cylinder triple expansion engine located at Elmira, N. Y., and being operated by the Elmira Illuminating Company for incandescent and arc lighting. In speaking of the machinery the author says: "The engine room is one story in hight, 177 feet long and 64 feet wide. Through the center of the room runs a jack shaft, 136 feet long by $6\frac{5}{16}$ inches in diameter; to this shaft the engines are belted from one side of the room and the dynamos from the other. The shaft is fitted with twenty clutch couplings, so that it is possible to use any combination of engines and dynamos desirable." The amount of power required for running this shaft is perhaps more than would be ordinarily found with lighter construction, and without the clutches for operating machines in shops, yet the fact is here illustrated that the drag of the shafting is not to be neglected. Mr. Eldredge found that it required sixteen and six-tenths per cent of the total power of the engine to run the shaft —the indicated horse power being four hundred and seventy — when the engine was loaded to its full capacity, while with light loads from thirty to forty-five per cent of the power developed was consumed in this way.

MANY persons having worked out an idea in mechanical construction appreciate the necessity for patience and perseverance in order to bring a new process to a successful completion, and one of the most important requisites of all going to make up a successful issue of this kind is patience and unremitting application. There has been perhaps more difficulty encountered in the manufacture of large castings and plates of steel than in any other manufacturing process, and the difficulties surrounding this line of work are such as to make it seem almost impossible that the necessary endurance sufficient to bring about satisfactory results should be possessed by any one, yet the development of steel manufacture has come within the life time of the men who are now directing the operation, and to them great credit is due for the way in which they have stuck to their work in spite of discouragements and obstructions. Those who are liable to discouragement in pursuing any investigation should take courage from the case of Mr. John Fritz, the president of the American Society of Mechanical Engineers, who very modestly remarked at the St. Louis meeting of that organization, that he had had great trouble in introducing single plate armor in place of laminated armor which was used principally during and after the civil war. The time of the trial of the first plate which was manufactured under Mr. Fritz's direction was an occasion of great anxiety to him, but the result amply repaid the vast cost of bodily strength and personal sacrifice which he had endured. To produce that armor plate had required eight continuous years of labor covering an average day of sixteen hours, and during this time Mr. Fritz was away from the Bethlehem Iron Works for two whole days only which time was spent in going over the design of an engine required for the work, which was in the hands of Mr. E. D. Leavitt. In this case not only was a new process involved, but entirely new machinery was required, which was not to be had in this country, and altogether the work seems too great for one man to have accomplished. It is to be regretted that Mr. Fritz was prevented by modesty from giving a complete account of his experience in developing these processes and for the benefit of all who have to do with work in which there is no precedent, it is to be hoped that Mr. Fritz will write of his experiences, for surely no greater difficulties from which success is to be evolved seem possible as confronting any one.

REAGAN ON POOLING.

In this issue will be found some utterances of the Hon. John H. Reagan, railroad commissioner of the state of Texas (who was also chairman of the committee on interstate commerce at the time the act to regulate commerce was under discussion), concerning the pooling of railroad revenues. It will be remembered that the anti-pooling clause was inserted in the law mainly because of Mr. Reagan's insistance. In fact it was the only means by which his consent to the joint bill could be obtained. In view of his recent utterances upon the subject, it is important to remember this, as showing how completely Mr. Reagan's view has changed. Prior to 1887, that gentleman, being without actual experience in railroad affairs, was very naturally opposed to anything, that, according to the popular notion, was so inimical to public policy, as pooling was supposed to be. Since that time, however, Mr. Reagan has had some years experience as a railroad commissioner, and has been consequently brought into contact with the problems attaching to the railroad question. Fortunately, his sterling integrity of purpose has borne fruit, and he is not now afraid to advocate that which because of a lack of apprehension, he formeriy condemned. The letter being concurred in by the other members of the committee appointed by the convention of railroad commissioners, has the full force of a report to that body.

Mr. Reagan realizes that in all legislation concerning railroads, two proposition must be kept in mind, and provided for, namely: The protection of shippers against excessive rates end unjust discrimation, and the preservation of the necessary revenue to maintain and operate railroads and pay a reasonable interest on the value of the property so far as the business will permit. In other words, it is admitted that the right of regulation involves the obligation of protection. If any one thing has been conclusively demonstrated during the past eight years it is that railroads cannot protect their revenues unless some means whereby restraint of illegitimate competition may be exercised is provided. An agreement between two citizens relating to commercial transactions, will be enforced by the laws of the country, but under present regulations, an agreement of the same nature between two railroad companies has no standing in court, and, as is pointed out by Mr. Reagan, it would not be necessary to provide efficient penalties by law for their violation as between the contracting parties before any such agreements would be effective.

In view of the recent decisions of the courts concerning the powers of the Interstate Commerce Commission to make rates, Mr. Reagan's opinions are suggestive. In the state of Texas, the railroad commission has the authority conferred upon it by the legislature to make, regulate, and maintain rates on state shipments. But it has been decided by the United States court that the rate-making power does not under the law inhere in the Interstate Commerce Commission, and to use the language of Mr. Reagan, "In the absence of such a law the pooling of freights and division of earnings could be authorized by law and so regulated as to prevent to a large extent, if not entirely, railroad wars and unjust discriminations in freight rates with advantage to the railroads and to shippers."

Such testimony coming from one who was formerly

pronounced in his opposition to the pooling idea, is not only significant, but should have great weight with congress in its consideration of the bill which proposes to amend the law in this respect. Not that the conclusion reached by the gentleman in question is at all strange. So far as is known, no one who has given any careful study to the question has failed to arrive at the same result. It is apparent that if the act to regulate commerce is to be given its fullest effect, in the prevention of discrimination, the commission must be empowered with absolute authority to define rates, or else provision must be made whereby agreements concerning rates shall be made enforceable at law. Which of the two propositions is the simpler as well as the most effective hardly admits of discussion. It is manifestly impossible for the Interstate Commerce Commission to prescribe the rates that shall be established for transportation charges throughout the United States. Any attempt to do this would only result in chaos. But it is not at all impossible to so regulate and control the making of traffic agreements under the supervision of the commission as to simplify present methods and benefit both shipper and carrier. It is of course now beyond hope that anything looking toward the enactment of such a law will be considered during the present session of congress, but the letter of Mr. Reagan is a valuable addition to the arguments which may be presented in favor of such a bill at a future session.

LENGTH OF INDICATOR PIPES.

A time-honored rule in regard to the setting up of indicator rigging for investigating the distribution of steam in an engine cylinder, is that the pipe connections between the cylinder, and the indicator should be as short as possible in order to reduce the error of the instrument to a minimum. This principle seems almost axiomatic because there are two influences, viz., the friction of the steam in the indicator pipe and the surface radiation of heat which operate to cause errors in indicating, and both of these increase by lengthening the pipes. It has been claimed that there is no appreciable movement of steam in these pipes, but rather a pulsation of pressure with each stroke of the engine, and that the radiation of heat from the pipes was the only point to be watched. This does not seem to be a correct theory, and in the case of a high speed engine running with high pressure steam it is safe to say that friction has much to do with the inaccuracies of indicator work, in view of the long pipe connections which are ordinarily used.

It has been stated that there was no appreciable difference to be found in diagrams taken from an indicator located directly upon the cylinder of any engine, and from one located upon the end of a pipe which was two feet long and of varying diameter. A contemporary several years ago published an account of some experiments made to determine this point, and from a series of three tests with two indicators, one of which was placed upon a cylinder and the other on the end of a pipe twenty-four inches long, it was concluded that the old rule did not hold, as differences of only about one-half of one per cent. were found to follow the use of a pipe of this length. The speed of the engine was over three hundred revolutions per minute, and the size of the cylinder was 10x12 inches. The account referred to contained the following paragraph: "It is a mistake to draw a universal conclusion from so limited a test, but the figures unquestionably point to the fact that the usual instructions for close pipe connections are unnecessary." If these results are taken as conclusive, and as they have been taken by some people, the use of long indicator connections will continue, and the mass of unreliable results of steam engine tests will receive frequent contributions.

Fortunately, however, the matter has not been allowed to rest at that point, but it has been the subject of further investigation by Prof. Goss, of Purdue University, whose attention was attracted by the earlier tests, and who took up the question with the results which appear in the abstract of a paper by him given elsewhere in this issue. Such a question should not be considered as settled by a single test or series of tests upon one length of pipe only, in addition to the cylinder indicator, and, while it is true that "one carefully conducted experiment is worth more than all the hypotheses that can be applied to a given case," it is also true that "one swallow maketh not summer." In the remarks by Prof. Goss, before the Western Railway Club in March, 1894, is an account of some experiments made by him with an indicator rigging applied to the laboratory locomotive "Schenectady," in which one of the pipes was three and one-half feet in length, while the other indicator was connected direct to the cylinder. The following is what he said of the results: "The record shows that for a speed of 56½ miles per hour, the mean effective pressure given by the indicator on the cylinder is to the mean effective pressure given by the indicator on the pipe as 1 is to 1.17; or, if we accept the record of the indicator on the cylinder as true, the showing of the pipe indicator is in error to the extent of 17 per cent." This is, as the author states, an extreme case, but his conclusion is so at variance with that previously quoted that one of them must clearly be wrong.

In another publication Prof. Goss draws the following conclusions relating to the three and one-half foot indicator pipe used upon the laboratory locomotive: "(1) At slow speeds the results are practically identical. (2) As the speed increases a difference appears; the difference being measurable at a speed of 40 miles per hour or 212 revolutions per minute, and it is pronounced at 60 miles per hour or 320 revolutions per minute. (3) When the speed is such as to give a difference the diagram from the indicator or the pipe is larger than the diagram from the indicator or the cylinder; that is, the mean effective pressure appears to be increased by increasing the length of the pipe connection between the indicator and the cylinder." These conclusions were published before the tests described in this issue were made, but the results are in close accord, and of the experimentors who have taken up the question Prof. Goss unquestionably has stronger grounds for his conclusions. The later tests, described in this issue, made use of different speeds and widely-differing lengths of pipes, and constituted a broad ground upon which to base conclusions. His results are convincing, and he is entitled to credit for pursuing such a practical and important subject to what may be called a final finish, as far as showing the tendency of long pipes is concerned. Much may be added in giving numerical values of certain changes, but the fact of the bad effect of long pipes may be considered as settled, and the commercial importance of this knowledge is very great.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

In our issue of last week an account was given of the first two sessions of the meeting of the American Society of Mechanical Engineers in St. Louis, and the following paragraphs complete the account of the meeting:

On Thursday morning, May 21, the fourth session was opened by the reading of a paper by Prof. Goss upon the subject of the "Effect Upon Diagrams of Long Pipe Connections for Steam Engine Indicators." This paper appears in abstract in another column, and as will be seen, was complete in itself. The statements were made with such clearness as to bring out no discussion of the points involved.

The next subject was "A Hydraulic Dynamometer," a paper by Mr. J. D. Hoffman, which described a form of dynamometer employing two cylinders to convey the thrust of the shaft to the indicating apparatus through a tube containing oil. In the discussion, Mr. Gus Henning expressed preference for diaphrams in place of cylinders in such construction, owing to the leakage which must necessarily occur when cyliuders are used, and which by changing the stroke of the piston introduced errors through changes in the position of the base line. The author of the paper, however, preferred the construction employed after having given diaphrams a trial. The objection to diaphrams was the variations introduced by difference in the motion of the pencil for different parts of the stroke of the diaphram. The author found no difficulty with regard to the change of the base line from leakage because of the short time covered by the tests. The friction of the pistons was almost nothing, and the leakage amounted to but one-half pint of oil daily.

The next subject was "A Study of the Proper Method of Determining the Strength of Pump Cylinders," by Mr. Charles W. Kettell, in which it was shown that in designing pump cylinders and the decks thereof upon which the valve seats were located, formulæ now available are not to be relied upon. The author worked out a method which is not based upon the assumption that the sides of the cylinder act as a single beam, or on the other hand that they act as a part of the cylinder and hence are under simple tension only, but all of the forces are recognized and given place in the paper. Prof. R. C. Carpenter then presented a paper entitled "A New Form of Steam Calorimeter," which was severely criticised by Mr. George H. Barrus, of Boston, as not being a reliable instrument, and also objections were made to some of the statements made by the author.

Following this was the paper by Mr. George I. Henderson, entitled, "Spring Tables" in which the formulæ previously presented by the author in a paper before the society were worked out in tables for use in designing springs. There was no discussion of this paper, which was followed by one entitled, "Effect of Retarders in Fire Tubes of Steam Boilers," by Mr. J. M. Whitham. In the discussion several members sought to show that the same results as were obtained by Mr. Whitham might be produced by the employment of deflector plates similar to those in use in the front ends of locomotive boilers. Serve tubes, which were referred to in the paper were defended by Mr. W. Carlile Wallace, representing Messrs. John Brown & Co., of the Atlas Steel Works, Sheffield, Eng., the manufacturers of these tubes The use of compressed air for cleaning fire-tubes was urged and it was shown that the use of retarders or gas mixers in the tubes did not necessarily interfere with cleaning them easily. Mr. Whitham presented a second paper upon mechanical stokers, in which tests on a number of types were described. In the discussion, Mr. Bryan, of St. Louis, quoted the experience with this kind of apparatus in that city as being unfavorable, and there was no automatic stoker now in use there which he considered satisfactory. Mr. A. A. Carey, of New York, spoke highly of the "American Underfed Stoker," the regulation of which as to feeding the fire was easily adjusted to burn from twenty-five to a thousand pounds of coal per hour as required, and the mechanism was such as to enable automatic regulation of the fuel supply to be made which should be governed by the pressure of the steam in the boiler, this being also accompanied by automatic regulation of the air blast. The last paper of this session was by Mr. William H. Bryan, entitled, "The Western River Steamboat" which contained illlustrations of the engines of one of the boats now running on the Mississippi river and constituted a defense of the practice now in use in that particular service. It was shown that present practice is simply the survival of the fittest, nearly everything which could be suggested for an improvement having been tried and discarded. In the discussion Mr. William Kent stated that the Western river steamboat needed no defense before this society, as it was well understood that the exigencies of the service would not admit of using anything else, and the subject having been already fully presented to the society, he did not see the value of another paper in this line.

The session of Friday, the last day of the meeting, opened with the presentation of a paper upon superheated steam by Prof. R. H. Thurston, which was discussed by Mr. G. J. Rockwood, who spoke of the use of direct superheaters whereby the steam was upon one side and the fire upon the other side of metallic walls as being dangerous, and urged the employment of superheaters employing hot steam to heat the cylinder steam which operates after the manner of a feed water heater. The next paper was by Mr. L. R. Alberger, entitled, "A Self-Cooling Condenser," an abstract of which was printed in the RAILWAY REVIEW of last week. In the discussion of this paper, Mr. C. E. Emery, of New York, spoke of the importance of knowing the results in efficiency obtained with and without the use of a condenser. Mr. William Kent spoke of the large towers filled with fagots which were used for cooling compressed air in connection with the Popp system in Paris. The tower for Mr. Alberger's arrangement was more efficient and permitted of a great saving of expense due to the cost of real estate over that required by the French system. Beside this, the expense of a metallic tower was not necessary with Mr. Alberger's design, because a wooden box would answer the purpose equally well. Mr. E. D. Meier, of St. Louis, spoke of the muddy water, which was the only available feed supply in that city, and believed that for steam plants along the Mississippi river, the self-cooling condenser, would provide a means for the saving of a large amount of the expense of boiler repairs. An additional advantage to be obtained by this apparatus was pointed out in con-

nection with the disposal of exhaust steam from present non-condensing plants of electric lighting stations, many of which were located in residence districts.

The remaining two papers were by Prof. F. R. Hutton and Mr. Thomas E. Murray. The former was a record of the classification system employed by its author in cataloging the library of the American Society of Mechanical Engineers. The latter paper described a novel steel plate fly wheel. They were both briefly discussed, and the subject of the preparation of a standard classification for a general engineering library was referred to a committee for report at the New York meeting. Announcement was made that a joint paper was expected at this meeting from Sir Henry Bessemer and Mr. James Dredge upon the history of the Bessemer, but which was delayed in transit. The meeting adjourned after a brief time spent in topical discussions, and after the attention of the members had been called by Mr. Meier to the fact that if they chose they might help materially in improving the condition of the engineer offices of the navy by urging upon their representatives in congress the necessity for improvement. The usual resolutions were passed thanking those who had contributed to the enjoyment of the members during the convention in arranging excursions and visits to places of interests among the manufacturing establishments. The next convention will be held in New York, it being the annual meeting.

THE EIGHTH ANNUAL CONVENTION OF RAILROAD COMMISSIONERS.

[*Continued from last week.*]

The second day's session of the railroad commissioners' convention was opened with a paper by Mr. Joseph Flory, commissioner from Missouri, on safety appliances, in which the necessity for their adoption and the progress made in that direction was fully set forth. The reading of the paper was followed by the adoption of a resolution protesting against the proposed amendment of the act to regulate commerce to repeal the imprisonment clause in section ten. The committee on uniform classification next submitted its report recommending that suitable legislation be had empowering the Interstate Commerce Commission to prepare and adopt such a classification. The report was followed by some remarks by Mr. A. C. Bird, in support of the proposition, and a resolution to that effect was unanimously adopted. The letter of Commissioner Reagan, of Texas, on the question of pooling of rates was next read. This letter will be found elsewhere in this issue. A communication upon the same subject from Mr. C. F. Lape, a former commissioner of Illinois was also read, in which the same position was taken. The others of the committee present stated that they wished to attach their names to the communication of Mr. Reagan, thus making it an official report.

The committee on organization and program for the next convention reported the names of Mr. Isaac B. Brown, of Pennsylvania, chairman; Mr. George W. Perkins, of Iowa, vice chairman; Mr. Edward A. Moseley, secretary, and Mr. Martin S. Decker, assistant secretary, as officers for that meeting. The report was adopted.

Mr. Flory then offered a resoultion to the effect that the next convention meet in St. Louis on the second Tuesday in May; which after considerable discussion and other invitations was also adopted.

A recess was taken at this point in order that the members of the convention might avail themselves of an invitation from the president to call upon him at the White House. After the recess the announcement of the committees for the next convention was made, and the various resolutions of thanks adopted, after which the convention adjourned.

During the month of April the passenger movement on all divisions of the B. & O. system was remarkable for punctuality. The through express trains arrived at their respective destinations on schedule time ninety-five per cent of the time. This is a performance rarely equaled by roads operating as many trains as are run on the B. & O., and speaks well for the efficiency of the rank and file, as well as the officials of the operating department. The effects of this are already apparent in increased passenger receipts.

The Passenger department of the Fitchburg R. R. has issued a summer book full of information about the beautiful country which that road traverses. It is historical and gives also the rates of board everywhere.

DECISION OF THE UNITED STATES COURT OF APPEALS IN THE GOULD-TROJAN COUPLER CASE.

This is an appeal for an order for injunction *pendente lite* made by the circuit court, northern district of New York, in a suit brought for alleged infringement of U. S. patent 254,106, granted February 28, 1882, to Clinton Browning and now owned by complainant. This patent was sustained by the same court in a litigation between the present complainant and Pratt & Letchworth, the coupler manufactured by the last named firm and known as the "Pooley coupler" being held to be an infringement of the Browning patent. An elaborate opinion was filed in the Pratt case, but we find none in the record of the case now on appeal. Such record contains all the testimony taken in the Pratt case and much additional evidence presented in affidavits.

LACOMBE, Circuit Judge:

The defendant contends that the patent in suit is anticipated; that it lacks utility, and that it presents no patentable novelty. In support of this contention there have been introduced many prior patents and much evidence, expert and other. It will not be necessary to enter into any extended examination of this branch of the case. The single claim of the patent reads as follows:

"In a car-coupling, composed of a bifurcated head and rotary interlocking hook, the combination, with said rotary hook, by means substantially such as described, for automatically opening and retaining said hook in proper position for coupling."

Of this claim the circuit court in the Pratt case says: "The claim covers both the feature of opening the hook and holding it open in a position for coupling. Of this there is no doubt. All of the experts agree upon this proposition. The complainant's expert says, and says correctly, that a coupler which has means for accomplishing but one of these results does not infringe." No one upon this appeal disputes the accuracy of this conclusion, and, in consequence, the question of infringement is much simplified. It will be unnecessary to determine to what extent the devices of defendant operate automatically to retain the opened hook in proper position for coupling, because unless it can be shown that defendant's device automatically opens such hook no infringement is shown.

As indicated in the claim, complainant's coupler belongs to the general class of couplings which are composed of a bifurcated head and rotary interlocking hook. Defendant's belongs to the same class, the prototype of which is the "Janney" coupler. This Janney coupler is thus described by one of the experts: "It consists generally of two drawheads (one on each car), each of which has a forked arm, to which is pivoted the knuckle or corner of an L-shaped hook, capable of swinging to one position to lock with the hook of the opposing drawhead and held in that position by a locking block or dent, and also capable of swinging to another position when the detent is withdrawn or turned to one side so as to uncouple from the hook of the opposing drawhead." Apparently all couplers of this class—certainly the Janney, the Pooley, the Browning and the Trojan—are *automatic couplers*. That is, after the parts have been put in proper position they will, unless accidentally disarranged, complete the act of coupling as the cars come in contact, without further intervention of the trainmen. In the old form of link and pin coupling, the trainman had to guide the link into its proper recess in the draw-head, and when it had entered he locked it by inserting the pin. With automatic couplers of this Janney class, as the cars come together, each stationary forked arm strikes the rotary L-shaped nook or "knuckle," causing it to revolve, so as to hook into the opposing "knuckle," and as soon as engagement is complete the locks or detents, which prevent the rotary hooks or knuckles from swinging back, drop into place. The bond of union therefore between the two cars is the interlocked knuckles held in place by the detents, and, barring accidents, it will hold the cars together as long as the detents remain in place.

The first step towards uncoupling the cars is necessarily the lifting of this detent from the position in which it holds the knuckles against rotation. When this is done the coupling is unlocked. In the original Janney coupler after it is unlocked by lifting the detent, the remaining parts remain in the position in which they were until some further exercise of the human will, applied directly or indirectly by some further exertion of human power, causes them to move. If, after the detents are unlocked, the two cars are drawn apart, the rotary knuckles will swing, each the other, into an open position, thus severing the bond of union between the cars and completing the uncoupling. Or, the detents being unlocked, the trainman may take hold of the rotary knuckles with his hands and pull them open; or, again, he may reach them with a long-handled rod with a poker-shaped hook on the end and pull them open. No one pretends that such operation would be an "automatically opening" of the hooks. In the Trojan coupling a rod is permanently fastened to the end of the car running from the recess back of the hook to the side in the car. It is provided with a finger near the end of the recess, and when the rod is pushed inwards the finger presses against the inner end of the knuckle, and, if the detent is not in place, causes the knuckle to swing open. It is difficult to see upon what theory it can be contended that there is an exhibition of automatic action when a man of his own volition pushes a door open with a rod, and no exhibition of automatic action when the same man of his own volition pulls the door open with a hook. It is no doubt true that the same rod operates the detent. The rod is bent at right angles to itself at the side of the car, thus forming a handle by which it can be revolved. When it is thus revolved it raises the detent, but the raising of the detent does not set in motion any of the remaining mechanism. If the operator goes away after revolving the rod, defendant's mechanism does not open the hook at all. If the hook be opened by defendant's mechanism, it is only because of a separate act of volition on the part of the operator, put into action by a new and independent application of his physical strength to the rod, moving it in a new and different direction.

If the word "automatically" in the claim is to be given its ordinary and general meaning as used in common speech, defendant's device does not infringe. It is contended, however, that it is used in the patent with some new and peculiar meaning. It will be desirable, therefore, to consider the specification of the patent more in detail and to look somewhat into the prior state of the art in order to see if there is any justification for the contention that the word "automatically" is to be construed so broadly as to cover a device for opening the rotary hook, which is so emphatically unautomatic as is the defendant's. Much weight was given on the argument to the circumstance that Browning, the patentee, was not represented by solicitor before the patent office, and that he drew his own specification and original claims. The single claim finally allowed was phrased by the patent office, but the word "automatically" which it contains was Browning's own suggestion; it was prominently present in every form of claim which he submitted. The reason why he used it and the meaning he understood it to convey seems to be reasonably apparent upon reading his specification, which was not amended in the patent office. It is difficult to see why the circumstances that Browning had no solicitor should lead to any particularly liberal construction of his patent, in view of the fact that the description of his invention is singularly clear, complete, intelligible and unambiguous, an agreeable contrast to many which come before this court, where the inventor has been represented by solicitor.

The material parts of this specification are as follows:

"My invention relates to improvements in car couplings in which a rotating hook is hinged to a draw-head and the coupling is effected by the hook rotating inwardly, of which the Janney coupling is a representative, patented February 25, 1879, No. 212,703, the drawings of which I have copied and used in illustrating my invention.

"The objects of my improvements are to rotate the rotary hook automatically to the desired position for the purpose of effecting the coupling; second, to automatically retain the rotary hook in proper position until required to rotate in the act of coupling.

"In the Janney coupling the rotary hook, when not in use [i. e., when not coupled with another car and locked in place], having no retaining device by which it can be held in a certain position, is left free to rotate to any uncertain point by the jarring of the cars or by any object with which it may come in contact otherwise than by the coupling process. The object of my invention is, further, to overcome this very troublesome defect and to hold the rotary hook in a certain position, so that the coupling of cars can be accomplished with greater facility and less danger of breakage, which is often occasioned by both hooks being closed, or partially so, when the cars are brought together, also with less liability to bodily accidents than when the couplings are manipulated by hand.

"I attain these objects by the two following devices, illustrated in the accompanying drawings, which I shall proceed to describe in detail."

The detailed description shows draw-heads of the Janney type, each with a rotary hook. The rotary hook is locked by a pawl, the pawl being operated by a lever connected to and operated by another lever projecting through and above the platform on the car. Upon the outer circle of the knuckle of the rotary hook there is arranged an elastic strap and a spiral spring, having sufficient tension to rotate the hook from its closed position to the open position, and to retain the same in the last-named position as the proper one for admitting the opposing hook and successfully coupling cars. The second device shows a lower knuckle, having a spiral incline, and a rotary hook having a corresponding incline. "These inclines move upon each other in the act of rotating. The rotary hook moves upon the incline in the act of closing until it reaches nearly the highest point of the incline. Upon being released by the pawl, it rotates outwardly, dropping to [the lowest] point of the incline, and [the open] position; this outward rotation being accomplished by its own gravity, consequently occupying the lower position until force is applied to change it, thus avoiding the dangers and delay of placing the rotary hook in position by hand."

It is evident that each of the mechanisms described by Browning, whether it contained the spring or the incline became operative as soon as the detent was unlocked, without any further act of the trainmen and each remained operative, by reason of its own motive force, so long as the detent remained unlocked. Browning did not confine himself to the spring or to the incline as the source of this motion, for he concludes the specification with this clause: "I do not claim any particular device for accomplishing the rotation and retaining of the rotary hook C, or its equivlent, as the same can be accomplished in various ways."

It is urged on behalf of Browning that his improvement was most meritorious, because it tended to save trainmen from the risk of losing life or limb. It is contended by the defendant that in practice it does not operate efficiently in the way the specification indicates; that the spring or elastic strap is liable to fracture or distortion, and that the inclines become clogged with rust. Conceding, however, that it does all which the specification calls for, and that to the extent of its expected capabilities it does operate to save trainmen from some of the risks to which they were before exposed, that is no reason why it should be construed to cover any other operation than that which was evidently in the inventor's

mind, and which he plainly expressed in his specification.

When two cars are coupled together and it becomes necessary to uncouple, the first step is the unlocking of the rotary hook. This is done by raising the detent, and before Browning, devices were shown whereby the detent was raised by operating a rod which ran horizontally to the side of the car. Before Browning, it was necessary for the trainman to be personally present in order to raise the detent, and that necessity still exists. Before Browning, the trainmen could raise the detent without placing either his body or his arm between the deadwoods of the coupled cars, and the same condition of operation still remains. Before Browning, when the cars had been thus unlocked, it was not necessary for the trainman to step between the cars and pull the rotary hooks open with his hands; the separating movement of the cars would do that. There was no call for any new device in order to make it a safe operation to uncouple cars; safe at least against any risks consequent upon interposing any part of the person between the deadwoods. When the cars drew apart they opened the rotary hook (or hooks, if both were unlocked) into such a position that if, while still in such position, the cars were brought together again, they would automatically couple. The difficulty and the danger was connected not with the uncoupling, but with the coupling. The "very troublesome defect," as Browning calls it, was this, that the open position in which a rotary coupling hook was placed by the separation of the cars, which drew its head over the engaging hook, thus swinging one or both open, could not be maintained. The rotary hook was "left free to rotate to any uncertain point by the jarring of the cars or by any object with which it may come in contact otherwise than by the coupling process." When a car, therefore, equipped with the original Janney coupler had been uncoupled, and subsequently was approaching or being approached by another car, it was necessary for the trainman to look at it and see if the rotary hook was still open. If it were not, which would frequently be the case, it would then be necessary for him to pull it out either with his hands, or with a hand-hook, and this was the operation the risk of which Browning sought to avoid. The means he devised and described was such as operated wholly irrespective of the trainman. Whenever a jar or an accidental contact threw the rotary hook inwards from the open position in which it was left at the last uncoupling, then either the stored up power of the spring or the force of gravity operating on the inclines, without the intervention of the trainman, without his volition, without even his knowledge, began at once to work of its own motion to restore the hook to its proper position. Should the device work in practice as it does in theory, there would be no necessity for the trainman to be present immediately before coupling; *automatic* mechanism would at all times ensure the hook being thrown into and retained in its open position. Once let the detent be lifted and this stored up power becomes continuously operative, not only without any further intelligent action on the part of the trainman, but even against his will, so to speak, for when he has once unlocked the detent there is nothing in the mechanism, which he can avail of to stay the instant and continuous action of this self-acting force. This is the precise device which Browning has described in clear, intelligent and unmistakable language in his specification, and it would be difficult to find in the English language a phrase which more aptly, accurately and comprehensively describes it than that used in the claim —"automatically opening * * * said hook."

This feature is absent from the Trojan coupler. When the trainman has unlocked the detent he has not thereby released and set in motion any independent mechanism. If he then departs the hook is free to rotate as the cars come apart, but no act of his throws it open. If he pushes the rod forcing the finger against the knuckle and thus throwing the hook open, that is no part of the unlocking, no necessary sequence of it; it is a new act of the human will; an additional motion imparted by direct and positive action of the human muscles applying new force in a new direction. Moreover with the Trojan coupler, when the jarring of the cars or accidental and undesired contact has thrown the rotary hook inward out of the proper position for coupling there is no automatic power in the mechanism which will restore it to place. The trainman, as of old with the original Janney, has to look and see if the hook of an approaching car is in proper position; if it be not, there is no mechanism which will take his place, will appreciate the situation and do what is required; his intelligence is necessary to discover the defect, his volition is necessary to undertake its remedy, and his strength is required to restore the hook to its proper position. He does not, it is true, apply his strength by pulling the knuckle open with a poker hook which he carries in his hand, but he does apply it by a push upon the rod permanently affixed to the car, and which engages by its finger with the inner side of the knuckle, but this certainly, is not an "automatic opening" within any ordinary meaning of that phrase, and as it seems to us not within any unusual meaning which the state of the art or the language of specification will warrant reading into the claim.

The order of the Circuit Court is reversed with costs of this appeal.

The New York Central & Hudson River is with its accustomed promptitude out with its circular of summer outing places. It is gotten up in folder form and contains descriptive notices of the many places of beauty and interest reached by that road. This folder may be obtained free of cost by sending a two-cent stamp to Geo. H. Daniels, general passenger agent, Grand Central depot, New York City.

UNIFORM CLASSIFICATION.

The committee on uniform classification, appointed by the National Convention of Railway Commissioners, submitted the following report at the meeting held in Washington last week:

For a history of the work of the committee up to and including the date of the last annual convention we respectfully refer to the report of 1894, found on pages 34 and 35, and to the report of 1895, found on pages 39, 40 and 41, of the proceedings of the convention for said respective years.

In accordance with the resolution adopted by the last convention, your committee invited the different traffic associations of the United States and Canada to attend a conference with the committee in New York on October 23, 1895, for the purpose of discussing the subject of uniform classification and for devising some means for its accomplishment.

There were present at the meeting Hon. M. A. Knapp and Hon. J. C. Clements, of the Interstate Commerce Commission; Mr. A. C. Bird, freight traffic manager of the Chicago, Milwaukee & St. Paul Railway Company, Mr. J. M. Johnson, chairman of the committee of the Western Freight Association and general freight agent of the Chicago, Rock Island & Pacific Railway Company; Mr. H. B. Chamberlin, general freight agent of the New York, Lake Erie & Western Railroad, representing the Trunk Line Association; Mr. W. B. Hamblin, assistant general freight agent of the Chicago, Burlington & Quincy Railroad Company, and Mr. John Earls, chairman of the Canadian joint freight classification committee, and three members of your committee—Messrs. Billings, Bulkley and Mills.

All the gentlemen present agreed that for both the carrier and the general public a uniform classification of freight was desirable; in fact, the necessity and desirability of such classification has been recognized by the carriers ever since the enactment of the interstate commerce law. The several traffic associations of the United States, namely, New England Freight Association, Western Freight Association, Mississippi Valley Railroads, Trunk Line Association, Southern Railway and Steamship Association, Trans-Missouri Association, and the Southern Interstate Association, as early as 1888 appointed a committee, consisting of three members from each association, to formulate a uniform classification.

This committee held several meetings, and after giving the subject careful and earnest consideration agreed upon a classification and reported the same to the different associations for approval and adoption. It was approved and adopted by some of the associations, while at least one one withheld its approval, and for that reason it never went into effect. There was no law compelling the adoption of the classification by any of the associations or the roads belonging to such associations. Any one road, by dissenting, could defeat the whole scheme, and the same difficulty will be encountered in any attempt to arrive at uniformity by voluntary agreement of the carriers, and it is the opinion of your committee that unless uniform classification of freight is secured within a reasonable time by the voluntary action of the railroads themselves, the necessary legislation should be asked of congress requiring its adoption.

One of the difficulties that stands in the way of universal uniformity is the power of the different states to regulate the classification for state shipments. At the request of some of the gentlemen present at the New York meeting, the chairman of your committee addressed a circular letter to the different state commissions requesting their opinion as to the action of their states on the subject of a classification was agreed upon by the companies or made by the Interstate Commerce Commission by authority of congress.

From 22 out of the 28 states having commissions replies have been received, copies of which are filed herewith and made part of this report. Eighteen expressed themselves in favor of uniform classification and the expediency of immediate action by congress upon the subject; 4 are noncommittal, mainly for the reason that their commissions have no power upon the subject of rates or classification.

It would seem from this correspondence that a just and reasonable classification carefully guarding the interests of all sections of the country, such as would undoubtedly be made by the Interstate Commerce Commission if the subject were intrusted to them for adjustment, would soon be approved by all state authorities.

In their last report to congress the Interstate Commerce Commission recommended that that body take some action looking toward the adoption of uniform classification, and the National Board of Trade, at their 26th annual meeting, held in Washington, Jan. 28, 29 and 30, 1896, adopted a memorial to congress earnestly recommending the passage of a resolution requiring the Interstate Commerce Commission to prepare and publish on or before Oct. 1, 1896, a classification of freight articles and rules and regulations and conditions for freight transportation, to be known as the "national freight classification." The memorial and resolution were introduced in the senate by Senator Cullom and referred to the committee on interstate commerce.

Each member of the committee has received from Mr. James Peabody a copy of his paper read at the convention of 1895, entitled "A scientific basis for making carriers' rate schedule." This paper is entitled to careful consideration by anybody having authority to make a classification, but your committee do not deem it within their province to determine upon what basis a classification should be made. We think it proper to leave that for the consideration of the Inter-state Commerce Commission, should congress instruct them to make such classification.

We therefore refrain from expressing any opinion upon what basis a classification should be made, excepting that two points should always be kept in mind: First, that equal justice should be done all shippers and discrimination prevented in every form; second, that the revenues of the companies should be preserved so that money honestly and judiciously invested will receive a proper return on investment.

Your committee respectfully submit the following resolutions:

Resolved, That the National Convention of Railroad Commissioners, recognizing the necessity of uniform classification of freight in the interests of both the commercial public and the railroads, do respectfully recommend that the railroad companies of the United States, through their respective traffic associations, prepare for adoption by the Interstate Commerce Commission, the various state railroad commissions, and the railroads themselves, and that in the event of the failure of the railroad companies to prepare and adopt such uniform classification within a reasonable time, the necessary legislation should be asked of congress requiring the adoption of a uniform classification of freight, and that the Interstate Commerce Commission be charged with the duty of preparing and enforcing such classification.

Resolved, That the Interstate Commerce Commission be respectfully requested to communicate from time to time with the various railroad interests with the view of forwarding the work; and that the said commission be requested to present a suitable bill to congress in the event of a failure on the part of the railroads to prepare and adopt a uniform classification within a reasonable time.

IRA B. MILLS.
S. R. BILLINGS.
WM. KIRBY.
H. D. BULKLEY.

Mr. A. C. Bird, general traffic manager, C., M. & St. P. Py., addressed the convention as follows:

Mr. Chairman and Gentlemen: I am here, not on my own motion, but by invitation of the committee on classification. I think the resolutions are so plain and so well stated that but very little is necessary to be said on the subject. I want to add to that report but a few words. I do not believe that the members of this body realize to what extent the present condition of affairs leads to discriminations of the worst character. I do not believe there is full realization of the fact—the discriminations, hardships, and difficulties that are forced upon the carriers and the hardships and difficulties put upon the people. It would take more time than I have at my command, or than you could afford to give me, to go into the details and show to what extent the orders of the commission are set aside by the use of the various classifications. They are full of inequalities and injustice and difficulty in detail, and we meet them every day of our work. I was connected for a number of years with the standing committee that had charge of the preparation of uniform classification.

The work thus entered upon was purely voluntary on the part of the railroads. You all know the history of that work. It failed. That failure led me to the conclusion that nothing could be hoped for, nothing could be done, and no progress could be expected except through congressional action. I think there was a reason at one time to think that nothing could be done or nothing hoped for unless congress would take the matter in hand. There is a bill now pending before congress which in the ordinary course of business will probably be set aside and not be acted upon at this session. I believe that an expression from this body, assembly, or convention, such as is outlined in the resolution, will carry great weight. I sincerely hope, as all the railroad people in our section of the country hope, that you will be able to accomplish your desired purpose. I do not speak now as a matter of public benefit so much as I am speaking for the railroad interest. It will relieve the railroad people of an immense amount of detail work and great complication.

There is one reason why I have believed that action would be taken without the direction of congress. Classifications are mere matters of revolutions. There is no perfect classification. There is nothing satisfactory to the people who make it or to the people who use it. They are all full of errors. Classification is a growth, not a creation. It comes little by little. Errors are created, magnified, and continued from year to year. In the large area of this country there are three or four classification in use in the same territory applicable according to the origi- and nature of the freight. They result in great injustice. I doubt if the railroad companies are altogether strong enough to make these changes. Some inequalities in classification may be pointed out readily, such as favor certain districts, lines, or people, to the detriment of other districts and other people. For years these things have gone on and grown up, and around this defective classification the country has adjusted itself, and they have created more or less hardships in some localities which are brought out.

I do not think the railroad companies themselves have sufficient strength to stand up against the public clamor, so that I am perfectly convinced that it is the duty of the authorities to pave the way to introduce necessary reform. I do not think there is anything else I could add to take up your time further than this, to point out and to recognize the necessity so far as the railroads are concerned and the great trade bodies of this country. You will find the expression of this in numerous cases—I think the Chicago Board of Trade, the National Board of Trade, and the boards of trade in all the great cities in the interior. I believe that these resolutions, if adopted, will go very far toward accomplishing the desired purpose.

How Railways are Built in West Australia.

Our fellow subjects in West Australia are both enterprising and ingenious, and many people will read with interest the account of how they apply these very desirable qualities to railway construction. Some little time ago tenders were invited for the construction of a railway from Mullewa to Cue, to open up the Murchison and Yalgoo Goldfields. The railway was to be about 196 miles in length, and in the middle of December the various offers were taken into consideration, and the contract was awarded to Messrs. Baxter and Prince at £84,535-about £431 per mile. "They must be mad," some reader may involuntarily exclaim. Not so. At any rate, if they be there is method in their madness. This is not the first experiment in West Australia at constructing railways at almost incredibly low prices. Some months ago Messrs. Wilkie Bros. undertook to construct a railway from Southern Cross, the then terminus, to Coolgardie—a distance of 115 miles—and the contract worked out at £560 per mile, including station buildings, goods sheds, and indeed everything except rails and the fastenings. This was £310 per mile under the lowest price on record, and now the Cue contract has been placed at £129 per mile less.

How is it done? How can contractors build railways fit to travel upon at such a price and yet not accomplish their own ruin? It is managed in this way. The railway towards Coolgardie was opened on the 6th inst. to Woolgangie—roughly speaking 80 miles beyond Southern Cross, and 40 miles from Coolgardie. The contractors will hand over the first half of the line at the end of this month, but they will operate the remaining 60 miles on their own account until next September. This is the whole explanation. It is expected that trains will be run to the outskirts of Coolgardie by the end of next week, and, if so, the contractors will have nine months' traffic receipts to set off against the absolute loss they sustain on the construction of the line. A correspondent writing from Perth, the capital of West Australia, states that it would have caused no surprise had the lowest tender for the Cue contract been £200,000. The actual tender at £84,535 is obviously based on very large receipts from traffic during construction. At the present time the business on the Cue road is much smaller than on the Coolgardie but every month it is increasing. The low cost of construction has rendered it a comparatively simple matter to make the railways of West Australia pay a high amount of interest on the capital invested. It was not always thus, for in 1889 when 188 miles were in operation, the gross earnings were £6,500 less than the working expenses. In succeeding years a gradually increasing balance of revenue was shown, until for the financial year ending 30th June last, the return was 5.44 per cent.—a much great return than is yielded by the railways in other parts of Australasia. The average cost of construction of West Australian railways is £3,804 per mile. The cost of the railways of the other Colonies are:—Queensland, £6,902; South Australia, £7,297; New Zealand, £7,771: Tasmania, £8,382: Victoria, £12,570: New South Wales, £14,335. As regards the percentage of working expenses to receipts, the figures, 61.50, show that there is room for economy. New South Wales, with a percentage of 56.58, stands the best of all the Colonies with respect to this. Tasmania makes a most miserable showing as regards her railways. She swallows up 85.02 per cent. of her gross receipts in working expenses, and will it surprise anybody that with such extravagance in management her return upon her railways is 0.61 per cent?—[Transport.

RUE MANUFACTURING COMPANY INJECTORS.

A standard sized catalog (6 x 9 in.) issued by the Rue Manufacturing Company, 116 North Ninth street, Philadelphia, Pa. This is a 14 page pamphlet describing and illustrating the "Little Giant" and other injectors for locomotives, which are furnished by this company. It also contains an illustrated discription of Rue's ejector or steam siphon and directions for using the different kisnd of apparatus, the sizes and prices and directions for setting them up. This is known as catalog "B."

THE ELECTRIC MOTOR; its General Principles and Construction, by Mr. James F. McElroy, A. M. Consulting Engineer Consolidated Car Heating Company, Standard size 6 x 9.

This is a pamphlet of 30 pages, being a reprint of an address delivered February 11, 1896 by Mr. McElroy before the New England Railroad Club. This is an elementary discussion based upon the underlying principles of motor construction giving special attention to the magnetic effects and the different methods of armature winding. The language is selected with special reference to the author's object which was to present the subject in as simple a manner as possible for the benefit of men not familiar with electrical terms.

The annual catalog of Purdue University of Lafayette, Indiana, has been received. This pamphlet brings the work of the university up-to-date and contains announcements for 1896 and '97.

TECHNICAL MEETINGS.

International Association Car Accountants, June 9, Cleveland, Ohio.

Annual convention Master Car Builders' Association June 17, Saratoga, New York.

Annual convention American Master Mechanics' Association, June 22, Saratoga, New York.

Association American Railway Accounting Officers, May 27, New York City.

Association Railway Telegraph Superintendents, June 17, Fortress Monroe, Va.

American Association General Baggage Agents, July 15, Philadelphia, Pa.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street, New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Thursday in each month, at 8 p. m., at 12 West hirty-first street, Ne w York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumber land Publishing House, Nashville, Tenn.

Annual meeting Traveling Engineers' Association, Minneapolis, Minn., Sep. 8, 1896. W. O. Thompson, secretary 415 Marion street, Elkhart, Ind.

Annual Convention Roadmasters' Association and Road and Track Supply Association, Cataract Hotel, Niagara Falls, N. Y. second Tuesday in September, 1896.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meet ings on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnstone, 1522 Monadnock building.

The Technical Society of the Pacific Coast has a month y meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Western Society of Engineers holds its regular meetings for the transaction of business and the reading and discussion of papers on the first Wednesday of each month except January.

PERSONAL.

Mr. H. A. Haddock has been appointed superintendent of the Wagner Palace Car company, with office in Indianapolis.

Mr. W. H. Hunt has been made live stock agent of the Fort Worth and Rio Grande, with headquarters at Brownwood, Tex.

Mr. George C. Gilfillan has been appointed ticket auditor of the Burlington, Cedar Rapids & Northern, with office at Cedar Rapids, Ia.

Mr. Timothy W. Hammond has resigned as treasurer of the Worcester, Nashua & Rochester Railroad, after 49 years of service with that company.

An official circular announces the appointment of Mr. T. J. Clark as traveling passenger agent of the Rock Island, to succeed Mr. D. J. Flynn, deceased.

It is understood that H. C. Diehl, manager of the Interstate Dispatch, will succeed the late Mr. H. C. Parker as general traffic manager of the Lake Erie & Western.

Mr. E. M. Rhein has been appointed trainmaster of the Baltimore & Ohio for the Akron division. He will act in this capacity in addition to being chief train dispatcher.

Mr. George H. Campbell, Big Four freight agent at Cincinnati, has been appointed general agent in charge of trantportation of the Baltimore & Ohio, with office at Baltimore.

Mr. H. H. Filley, city engineer of Kansas City, has received the appointment of chief engineer of the Mexico, Cuernavaca & Pacific road, with headquarters in the city of Mexico.

Mr. R. M. Calkins has been appointed to the position of division freight and passenger agent of the Chicago, Milwaukee & St. Paul road, with headquarters at Mason City, Ia.

Mr. Edward Foley, foreign freight agent of the Erie lines, has resigned, and on June 1 will be succeeded by Mr. C. P. Lamprey, who since 1893 has been agent of the Erie Dispatch in New York.

Mr. J. H. Hanna, formerly traveling freight agent of the Grand Trunk in northern Indiana and Ohio, has been appointed assistant foreign freight agent of the Grand Trunk, with headquarters at Toronto.

Mr. E. S. Hutchins, freight claim agent of the Great Northern, having resigned to take a position on another road, that position will be filled by Mr. A. M. Thomas, formerly assistant auditor of the Northern Steamship Co. Mr. Thomas begins his new duties June 1.

Two offices have recently been established in the west by the freight department of the Michigan Central, the road never before having been represented west of the Mississippi river. Mr. J. J. Ford will fill the new office at Denver, while Mr. James A. Pill will be located at San Francisco.

Mr. J. J. Archer has been appointed assistant general freight agent of the Ohio River Railroad, and will assume his new duties on June 1, with headquarters at Parkersburg, W. Va. Mr. Archer was connected with the Norfolk & Western and its later acquirements for over eighteen years.

President Munson, of the Sherman, Shreveport & Southern road, has issued a circular announcing the resignation of General Manager F. W. Fratt. The office of general manager has been abolished and office of superintendent created. Mr. E. M. Alvord has been appointed superintendent.

Mr. H. A. Laing, who was recently made commercial agent of the Baltimore & Ohio at Kansas City, has been transferred to Quincy, Ill, in charge of traffic in Mississippi river territory, Dubuque, Ia., to Hannibal, Mo., inclusive, with office at 402 Main street. Mr. A. J. Davis takes the place vacated by Mr. Laing at Kansas City.

General Manager C. H. Rose, of the Lima Northern has appointed his private secretary, Mr. E. B. Hathaway, auditor of the company with office at Lima. The jurisdiction of Mr. C. A. Barnard, assistant general freight agent, and Mr. F. E. Fisher, assistant general passenger agent, of the Ohio Southern, has also been extended over the Lima Northern.

An official circular has been issued by the president of the Galveston, Houston & Henderson Railway, appointing Mr. G. H. Moore auditor of the company with headquarters at Galveston, Tex. He will have charge of all the accounts of the company and will report to the president. Mr. Moore has for the past ten years been chief clerk in the general auditor's office of the Frisco line at St. Louis. Appointment effective June 1.

In consequence of the resignation of Mr. A. E. Robbins, superintendent of the Toledo division of the Columbus, Hocking Valley & Toledo Railway, noted in this column last week, the jurisdiction of Mr. M. S. Connors, superintendent of the Hocking Valley & Ohio River divisions, is extended over the Toledo division, effective May 25. Mr. W. E. Costello, formerly chief dispatcher and division operator on Toledo division is appointed trainmaster of the division and Mr. R. S. Quigley, who has been Mr. Connors chief clerk is appointed trainmaster of the Hocking Valley & Ohio River division. Mr. Connors has selected Harry M. Waite, son of the late President, C. C. Waite, as his chief clerk.

General John Echols, receiver and general manager of the Chesapeake & Southwestern railroad of Kentucky and president of the National Valley Bank of Staunton, died in that place on May 24, at the residence of his son, State Senator Edward Echols. General Echols was born

in Lynchburg, Va., in 1823, and was educated at Harvard, Washington and Lee university and the Virginia Military Institute. He was a member of the Stonewall brigade, and was badly wounded at the battle of Kernstown. After he moved to Staunton he commenced practicing law. Twelve years ago he moved to Kentucky, where he had been prominent in railroad circles. He was a close friend of Collis P. Huntington, representing Huntington's interests in Kentucky and southwestern railroad circles.

Mr. J. H. Hill has been appointed general manager of the Galveston, Houston & Henderson. Mr. Hill is a young man for the position, being thirty-six years of age, but has been engaged in the railroad business since 1878. He started out with the Burlington at Omaha and went from there to Kansas City, where he was chief operator of the Kansas City, Fort Scott & Memphis. He then went to Lawrence, Kan., as superintendent of telegraph of a division of that road, embracing a division of about 1,000 miles. Later he went to Sedalia, Mo., where he acted as secretary to Messrs. Eddy and Cross, receivers of the Missouri, Kansas & Texas Railroad. Later he was secretary to General Manager T. C. Purdy, of the same road, and occupied that position until about eighteen months ago, when he left railroading to become general manager for Wisconsin of the Equitable Life Insurance Company of New York.

RAILWAY NEWS.

Baltimore & Lehigh—York Southern—According to report, negotiations are in progress for the consolidation of the Baltimore & Lehigh, which runs from Baltimore to South Delta, a distance of about 43 miles, and the York Southern, which runs from Peach Bottom to York, a distance of about 38 miles. The two roads formerly comprised the old Baltimore & Lehigh which was sold under foreclosure in two divisions in June, 1894. At the time of the sale the whole line was narrow gage, but in 1895 the York Southern was changed to standard gage, and should the proposed deal go through the Baltimore & Lehigh will also be converted into a standard gage road. This and improvements would necessitate an issue of $800,000 bonds by the new consolidated company. It is expected the consolidated line will be leased to the Pennsylvania R. Co., in which case it would be valuable to the Northern Central road.

Little Rock & Memphis.—Reports are current to the effect that Mrs. Hetty Green, owner of the Texas Midland, and mother of President Green, of that road, will buy in the Little Rock & Memphis road at the foreclosure sale of that road. It will become a part of the Texas Midland system, and when connections are completed it will be one of the largest systems in the southwest. Assurances have been given that the Midland will go from Paris to Little Rock via Hot Springs, and this little Rock extension is accepted as conclusive evidence that when the Little Rock & Memphis is sold under foreclosure it is to become part of the Texas Midland system. Martin Duvall, the chief engineer of the Midland road, together with a large corps of surveyors and linemen were camped at Cooper over Sunday locating the exact line for the Midland and also the place for the depot and switch yard. They are locating the exact line for the road to be built on and consequently move very slowly. The cash bonus which Paris was to raise was $30,000, but last week it was thought impossible to raise more than $25,000, and this was offered to President Green together, with other requisites in way of land, etc. This amount was refused. After the failure of the negotiations, however, a meeting was called on May 26, and, after some informal talk, the committee went to work and raised enough more to make $29,800 in all, and obtained 30 guarantors to the contract to secure right of way and depot grounds. Mr. Green was notified by wire, and answered that he would accept the proposition. Work will begin immediately at the Paris end of the line.

Little Rock, Hot Springs & Texas.—This road, also known as the Lott road, was placed in the hands of a receiver, Mr. J. S. Lonsdale, last February, and at that time all creditors were directed to intervene in the causes that their claims might be adjusted. So far the following interventions have been filed; Johnson & Hanson to the amount of $24,211.72 for the work performed in the construction of the road. Another intervenor, J. P. Nelson sets up claims against the road for $19,911.97. Mr. Nelson alleges that that amount is due him for services rendered and money advanced for labor and supplies from September, 1893, to May, 1896. J. H. Bennett also filed an intervention claim against the road for $3,700. E. Foster and J. Reilly came in with claims for $229.72 and $370 respectively. The latter's claim is for services rendered as a laborer in constructing the road. On May 26, the inextricable maze of litigation and legal controversy into which the road, has become involved, was more complicated by an intervention filed by Col. Uriah Lott, projector of the enterprise, in which he presents a claim for $309,041.09. From the statement attached to the intervention it appears that he paid $9,000 on two locomotives, $12,750 on rails and fastenings, $20,068.43 for ties, $14,687.16 for bridges, $142,366.18 to contractors and laborers, $17,279.33 for general expenses, besides many other items. Each intervenor prays that his claim be classified and declared a lien on the property of the road. Thus an almost endless chain of suits continues to grow out of the Lott railroad litigation.

Rumford Falls & Rangeley Lakes.—The new Rumford Falls & Rangeley Lakes railroad is open to travel, and the first scheduled train out over that railroad was run last week. The new road which was organized and begun in the fall of 1894, runs into the heart of the Maine wilderness, extending to Bemis, 28 miles from Rumford Falls and passing through one of the richest wooded districts of the state.

St. Joseph & Grand Island.—The reorganization committee for the St. Joseph & Grand Island R. has submitted a plan to the holders of the Central Trust Co.'s certificates of deposit for the first mortgage which was adopted by a vote of over two-thirds in interest. The plan provides for the issue of $4,000,000 of first mortgage gold bonds; $5,500,000 first preferred, $3,500,000 second preferred, and $4,600,000 common stock. The new firsts will bear interest at 2 per cent for two years, 3 per cent for three years, and 4 per cent thereafter, the bonds to run 50 years, and the first coupon to be payable July 1, 1897. The fixed annual charges of the company are at present $420,000. Under the reorganization the charges will be $80,000 for the first three years (including charges on $500,000 reserved bonds); $120,000 for the following five years; $160,000 after eight years, and including 5 per cent dividend on first preferred stock the total charges after eight years will be $410,000.

Sandy River.—The work of improving and straightening the road bed of the Sandy River road in Maine has begun, Mr. W. D. Smith, of Bangor, having the contract for the work. The line is about 18 miles in length and runs from Farmington to Phillips. Mr. Smith is employing 50 men at present, and the work will occupy several months.

NEW ROADS AND PROJECTS.

Arkansas.—At Little Rock, Ark., on May 22, articles of incorporation were filed for the Hoxie, Pocahontas & Northern R. Co. The road is proposed to run from Hoxie, Jasper county, to Pocahontas, Cape Girardeau county, a distance of 15 miles. The board of directors consists of Maxwell Coffin, S. C. Dowell, Gordon N. Peay, W. M. Kavanaugh, John W. Blackwood and Charles Coffin. Commissioners appointed to open the books of subscription are S. C. Dowell and N. R. Woods of Walnut Ridge and R. N. Hamill and J. H. Imboden of Pocahontas. Capital stock, $100,000.

British America.—A contract for the construction of the Lake Dauphin R. in Manitoba has been awarded to Messrs. Mackenzie & Mann, contractors of Montreal. It is expected that 100 miles, from Gladstone to Lake Dauphin, will be completed this year. Engineers are now at work locating the line, and the actual work of construction will commence about June 1. Running powers over the Manitoba & Northwestern R., between Portage la Prairie and Gladstone, have been secured to make connections with the Canadian Pacific and Northern Pacific & Manitoba Rs. at Portage la Prairie.

Mexico.—There is just now considerable trouble on the new Gulf, Rio Grande & Pacific, which is proposed to run from Juarez to Mazatlan, on the coast. The engineers who have been at work for the past month or six weeks surveying the line have come into El Paso, and refused to go any further until they are paid for what they have done. Morris H. Locke, who has charge of the work, says the secretary of his company is sick, but will be there with money to settle all indebtedness as soon as he can travel. In the meantime the surveying corps has been disbanded. Mr. Locke says things will be pushed through as soon as the present hitch can be straightened out; that that he has a concession from the Mexican government carrying with it a subsidy of $14,000 per mile for the construction of the road.

The concession granted by the Mexican government to Mr. Richard Honey for the construction of a road from Pachuca to Tampico has been renewed. In speaking of this the Mexican Financier says? "The renewed concession empowers Mr. Honey to build a railroad which is to start from the city of Pachuca, to pass through Apulco, and to terminate at the port of Tampico, and to afford connection, either by the main line or by branch, between the towns of Tulancingo and Zacualtipan. The concession also carries the right to build as many branches as may be deemed advisable, and be approved by the department of communications, with the understanding, however, that no subsidy shall be paid with respect to more than 100 kilometers of branch lines. Within six months from May 6, 1896, at least 10 kilometers, in addition to the 10 already approved, must be built and in each subsequent period of two years at least 50 kilometers must be constructed, but in such manner that the main line and its branches be completed with 12 years counted from April 17, 1893. The government grants a subsidy at the rate of $6,500 for each kilometer of track of the standard gage built by the concessionaire or by the company to be organized by him. Said subvention shall be paid in 5 per cent interior redeemable debt bonds at their full nominal value. When the bonds are delivered, all matured coupons, as well as that next to mature, shall be detached."

Missouri.—It is understood that the financing of the Kansas City & Northern Connecting R. has been finished and the actual construction of the railway will be pushed as quickly as construction contracts can be let. Mr. A. E. Stillwell, of Kansas City, Mo., president of the Missouri, Kansas & Texas Trust Co., has returned from Europe, where it is said he completed financial arrangements for building this road from Kansas City north to Pattonsburg, Mo., about 70 miles, and a company has been incorporated under the name of Missouri Construction Co. to build the road. The road is a scheme for amalgamating the Kansas City, Quincy & Omaha and the Omaha & St. Louis lines. The new Northern Connecting R. to be pushed ahead now picks up the Omaha & St. Louis at Pattonsburg, Mo., and the Kansas City, Quincy & Omaha at Trenton, Mo. Connection will probably be made with the Des Moines & Kansas City at Gainesville, Mo. Thus a new system is provided reaching directly from Kansas City to Omaha, Des Moines and Quincy. The Baltimore & Ohio Southwestern is now at Beardstown, Ill., and will be brought to Kansas City. This new system will create the first essentially Kansas City R. north of the Missouri river. The incorporators are A. E. Stillwell and J. McD. Trimble, of Kansas City; Theodore and Winthrop Gilman and Edward T. Stotesbury, of New York, and George C. Thomas, of Philadelphia. It is thought that the Kansas City & Atlantic, extending from Kansas City to Smithville, 21.7 miles, will probably be used for an entrance into Kansas City.

Pennsylvania.—Surveys for the Bellefonte & Clearfield road are now completed between Bellfonte and Philipsburg, and it is thought that work will soon begin. The length of the projected line is 56 miles, and from Bellefonte goes up the Bald Eagle Valley as far as Unionville. There it will cross the Alleghenies, following the course of Dix run. This route will require one tunnel, but it will give a grade over the mountain comparatively easy. The road is virtually an extension of the Central railroad of Pennsylvania, which runs from Mill Hall, in Clinton county, to Bellefonte, and it is supposed that the road will be a connecting link with a chain of roads through to the west, independent of any other trunk line now in operation.

INDUSTRIAL NOTES.

Cars and Locomotives.

—The Beech Creek Ry. Co. is to put Schoen bolsters under 200 cars.

—James A. Gardner, of Chicago, has been receiving figures this week for the building of 250 coal cars for the Munising Railway.

—The Monon road is reported to have adopted the Trojan coupler as the standard for that line.

—A representative of a California road was last week at the Brooks locomotive works in Dunkirk to confer with the company concerning the building of a number of locomotives to use crude petroleum for fuel. In Southern California crude oil is cheap, while coal is very dear.

—Instructions have been given to equip 5,000 Lake Erie & Western freight cars with automatic couplers and air brakes, and its sixty freight engines will also be equipped with air brakes. It will require several months to complete the work, but it is to be the chief business of the company's shops for some time.

—The Lehigh Valley Railroad Company has awarded to the Baldwin locomotive works the contract for 20 freight and 5 passenger locomotives mentioned in our issue of May 9.

—The "Little Giant" coupler, manufactured by the Buckeye Malleable Iron and Coupler Co., has been specified on the 5,000 freight cars which are to be built for the Baltimore & Ohio Railroad Co. This company has appointed C. H. McKibbin & Co. general agents, with offices in the Equitable building, 120 Broadway, New York.

—It is stated that the Florida Central & Peninsular Railroad Co., after investigating the Schoen truck and bolster, has adopted them as its standard.

—The order for 200 furniture cars for the Chicago & Great Western Railroad has been placed with the Wells & French Co. of Chicago.

—The Wisconsin Central is running 375 ore cars through its shops at Stevens Point for general repairs and to equip them with air brakes and automatic couplers.

—Nelson Morris & Co. have placed specifications in the hands of the car builders for 50 refrigerator cars.

—The Pullman Co. has received orders to build 20 passenger coaches for the Brooklyn Bridge Co.

—The Missouri Car & Foundry Co. has secured the order for the building of 50 flat cars referred to in our issue of May 9.

—The Chesapeake & Ohio are reported as about to order from 200 to 300 freight cars.

—The Michigan Central has sent out specifications on 800 freight cars.

—The New York, Chicago & Boston Refrigerator Co. is building ten refrigerator cars in its shops at Elsdon Station, Chicago. These cars will be equipped with air brakes, automatic couplers and Fox trucks.

—The specifications for 200 box cars for the Wheeling & Lake Erie are stated to be in the hands of car builders.

—The Brown Car Wheel Works, of Buffalo, N. Y., announce that they have acquired the business, plant, and good will of the Rood & Brown Car Wheel Works, that firm's partnership having expired by limitation. The new firm consists of Mr. Geo. M. Trefts and Mr. Henry M. Brown, who is one of the most experienced car wheel makers in the country. The Brown works will endeavor to maintain the high quality of wheels which the old firm always turned out.

—William Greene, general manager of the Baltimore & Ohio, has contracted with the Richmond Locomotive works to build twenty-five freight engines of the same type these works built for the Big Four.

—It is stated that the new balanced locomotive designed and patented by Mr. George S. Strong has been completed at the Sparrows Point works of the Maryland Steel Co., and that it will soon be sent to Purdue University at Lafayette, Ind., for an exhaustive series of tests. The principles of balancing and the other new elements of the design have been described in these columns, and it is

hoped that the details may be presented in the near future.

Bridges.

—The Pitt county authorities at Greenville, N. C., are about to erect a new iron and steel bridge across the Pamlico river near Greenville, to take the place of the present wooden structure. It will be over 1,500 feet long, with stone abutments, etc., of 100 feet at each end.

—A press dispatch from Polo, Ill., says a new iron bridge is to be built across Pine creek at Seven Mile Branch.

—Bids are asked until June 22 for erecting a concrete arch or iron bridge with masonry foundations at Currie, Minn.

—The Pittsburg Bridge Co. has been awarded contracts for the erection of the superstructure of six bridges, to be placed across streams in Allegheny county. The contracts amount to $9,700.

—According to press reports Engineer Waldow, who has been conducting the soundings for a railway bridge across the Missouri river at Yankton, has submitted his estimates to representatives of the English capitalists, at Chicago, Ill., who have determined to build the bridge. The only gentlemen who are on the inside of this deal are J. J. Hill, Senator R. F. Pettigrew, of Sioux Falls, S. Dak.; Congressman R. J. Gamble, and Arthur Nation. The latter is the Yankton representative of the English creditors of J. T. M. Pierce.

—The King Bridge Co., of Cleveland, has received the contract for the superstructure of a bridge across the Youghiogheny river at Suterville, Pa.

—The city council at Providence, R. I., has been petitioned to build a steel viaduct at South Main street, at a cost of about $100,000.

—Bids will be received by the county auditor of Adams county, till June 9, for the construction of an iron or steel three span bridge and iron sub-structure for the same over Stout's Run, half a mile west of the village of Rome, Ohio.

—The governor of New York has has signed bills authorizing the building of a steel viaduct over the railway tracks at Brook avenue, to cost $100,000; for a bridge over the Bronx river Westchester avenue, to cost about $100,000, and for a structure over the Mott Haven canal at 135th street, to cost $30,000.

—The commissioners of highways of Oregon township, Ill., are asking for an appropriation from the county treasurer for aid to build a bridge across Rock river.

—The Morgantown (W. Va.) Bridge Co. has let the contract to John A. Roebling's Sons Co. for repairing the cables of its bridge, and the work is now under way. Bids will be received during June for reconstructing the roadway, 22 feet wide and 612 feet long, with iron floor beams or girders, and perhaps iron parapets or strengthening trusses.

—The commissioners of Skagit county, Wash., have decided to rebuild the bridge across the North Fork of the Skagit river, which washed out at the recent flood. The contract was let to the Pacific Bridge Co. of Portland, for $11,600, exclusive of riprapping. The bridge will be of steel, with a draw 232 feet in length on a 20-foot cylinder. The total length of the bridge and approaches will be 500 feet, and the abutments will consist of piles.

—The Pennsylvania Steel Co. has been awarded the contract by the Niagara Falls Suspension and Niagara Falls International Bridge Companies for the erection of the steel arched bridge which is to supplant the present famous suspension bridge built by Roebling in 1855, who also afterward constructed the Brooklyn bridge. George G. Burrows is the American president and Thomas R. Merritt the Canadian president of the parties to the present contract. The arch, of which there will only be one, measures 550 feet and the center will be 260 feet above water level. This is the largest single steel arch ever built. The entire length of the bridge will be over 1,100 feet. It will be a double-decked open structure and on the upper deck two tracks will be laid, while on the lower deck will be two electric car tracks, a roadway and two foot walks. There will be two ribs or main arches of 550 feet long by four feet deep and three feet wide and will be shipped in 25 ton sections. It will require a little over 7,000,000 pounds of steel to construct this immense roadway for public travel. The construction will be done by the cantilever process and no superstructure will be necessary. Although this new bridge will occupy the exact position of the old one, the traffic of either the steam or motor lines will not be interfered with. L. L. Buck, engineer of the above mentioned companies, is the designer of the new structure, and is also designing the new suspension bridge across the East River at New York. The structure will cost in the neighborhood of a half million dollars and must be completed in one year. The old suspension will also be removed by the steel company.

Buildings.

—Joseph Reid, manufacturer of the Reid gas engine, is building a new foundry to his plant in Oil City, Pa. The machine shop will also be built larger, so that the output of gas engines will be doubled.

—The Jacksonville Terminal Co., will soon advertise for bids on the erection of the proposed union depot, to be of brick and granite, 361 x 131 ft. D. E. Maxwell, general manager Florida Central & Peninsular Railroad, Jacksonville, may be addressed.

—During the past few weeks small groups of men have been dismissed from the Grand Trunk workshops. A statement has been circulated among them that no more locomotives were to be built in Canada, the new manager having determined to look to the United States for these in future, not because the deficiency in Canadian workmanship, but because they can be built across the line much cheaper. Canadians having to pay a heavy duty for much of the raw material imported. It is rumored that Norton Mills, Vt., is the point at which the road will consolidate its shops and yards and also that the custom house may be removed to this place.

—A machine shop will be erected at Cumberland, Md., by Henry Handywide, who has purchased a site for the purpose. He will put in a complete machine equipment.

—Thomas Carlin's Sons, of Allegheny, have purchased property adjoining their works, River avenue, for the future extension of the plant, which will also give them increased railroad sidings on the Pennsylvania and Baltimore & Ohio systems.

—F. W. Wheeler & Co., West Bay City, Mich., will rebuild their recently burned blacksmith shop in steel department; it will be of steel construction, 75 x 250 ft.; engine, shearing, bending and punching machinery, trip hammers and other sheet steel working machinery will be put in. Two of the 400 ft. steel boats of Rockefeller's new fleet are being built at this yard.

—The United States Projectile Co. of Brooklyn, N. Y., is erecting a new building to meet the large demand for its products. The new building will be 100 ft. wide and 450 ft. long, of steel skeleton structure throughout. The steel work for the building has been designed and will be erected by the Berlin Iron Bridge Co., of East Berlin, Conn. The trusses have a clear span of 100 ft., and the general construction is such that it will make one of the finest buildings of its kind in the country.

—Application has been made for the incorporation of the Georgia Car & Manufacturing Co., with a capital stock of $500,000. The company is composed of capitalists of Savannah, Ga., and they have recently purchased a car plant at Huntington, Pa., which will be removed to Savannah and capital added until the full capital stock is invested in the plant and business. It is said that a site for the plant has been purchased for $15,000. The plant will include car building and repairing branch, vulcanized wood factory, car wheel foundry, axle foundry, etc.; erection of buildings is to be commenced at an early day.

—The Scranton Steel Co., Scranton, Pa., will shortly increase its plant so as to make structural shapes, etc., and will put in a complete outfit of this sort.

—The Fort Pitt Bridge Works, Pittsburgh, Pa., has been granted a charter for the manufacture of architectural, structural and ornamental iron and steel, capital stock, $100,000. The company will at once commence to build.

—The new plant of the Weldless Tube works at Newark, O., the incorporation of which company was noted in our issue of last week, will consist of seven buildings, the largest being an open-hearth steel works 70x120, a sheet rolling mill 120x400, and two weldless tube works each 80x235. The shops will cover 12 acres of ground.

—It is stated on reliable authority that an immense steel plant is contemplated by the Reeves Iron Company, of Canal Dover, O., to be constructed in the bottom lands east of the C. & M. railway. Capitalists from Cleveland and other points are interested.

—The deal between the Cotton Belt road and Tyler, Texas, for the location of the general shops at Tyler, and which has been pending for several months, has been fully agreed to, and all papers signed. The railroad company purchased over $23,000 worth of land, and the citizens of Tyler gave a bonus in cash of $15,000, according to plans and specifications. The shops will be the largest and most complete in the state.

Machinery and Tools.

—The Brown Hoisting and Conveying Machine Co. has lately closed a contract with the Pennsylvania R. for one Brown patent rapid double cantilever machine for handling general merchandise on Pier "J," Jersey City, to and from ocean steamers to cars. This machine has been designed especially for Pier "J," and will be the first special machine for the rapid handling of freight ever erected in New York harbor. It will hoist its full load of five tons 150 feet per minute, and trolley same 900 ft. per minute, while the entire machine will move along the pier 600 ft. per minute. It is operated by steam, and will be handled in every function by a single operator. The engines, boilers, and operating mechanism are contained in a house 21 ft. square on top of the machine. An attachment for handling bulk material, such as sand, sulphur, pyrites, etc., and loading same into box cars, will be provided, and it is expected this machine will revolutionize the handling of ocean freight in New York harbor. It will be in operation about September.

—For some time the Penberthy Injector Co., of Detroit, has been looking forward to the rounding out of its first 100,000 injectors. It had anticipated reaching the number about the 1st of July, but the demand for their goods has been so heavy, that they have turned out a larger number than anticipated, and have just reached the number 100,000, which was placed on a one-half in. injector on May 12th. In honor of this event the company will give their employes a holiday and excursion a little later in the summer, probably during the latter part of June.

—John C. De La Vergne, president of the De La Vergne Refrigerating Machine Co., died in New York on May 10. About 20 years ago he became interested in the Burr Brewing Co., and with W. H. Burr, of that firm, he invented the refrigerating machine for breweries, and since that time this business has occupied his attention. In 1883 there was a lawsuit between the partners, in regard to the patents, which resulted favorably to Mr. De La Vergne, and the fine factory in this city was built for the manufacture of this line of machinery.

—The J. A. Fay & Egan Co. has received, in the face of the strongest European and American competition, a large order for locomotive and railway car shop tools for Russia. This order, amounting to over $10,000, is especially gratifying inasmuch as, being the second received during the course of a few years, it shows the high esteem in which the machines are held and the splendid reputation they have gained for themselves.

Miscellaneous.

—The American Decorative Co., manufacturers of "Lignomur" and "Cameo Reliefs," report good progress in the introduction of these materials for head linings of cars, and while their adoption is not rapid the general use of "Lignomur" is continually gaining ground among the railroads. The office of the company is 68 Pearl street, Boston.

—The American Signal Co., of Baltimore, Md., reports an excellent business, and among the recent applications of grade-crossing signal protection apparatus mentions an interesting piece of work at Essex, Ont., for the Michigan Central R. R. The signal is placed at the main street crossing, and it is reported that the citizens, as well as the officers of the road, are much pleased with the operation of the apparatus. This is one of the recent applications upon this road which is specially referred to on account of the notice which it has attracted Mr. G. W. Smith, general manager of the American Signal Co., writes that he is replacing a number of old track boxes on signals, which were put in some time ago, with the new circuit controller, illustrated in the RAILWAY REVIEW of last week, and that work of this character has been completed upon the Chicago & Grand Trunk, the Western New York & Pennsylvania, the Monongahela River, the Grand Rapids & Indiana, the Northern Central, and the Lehigh & Hudson River R.

—The Illinois Steel Co. has converted a part of its North Chicago works into a cement plant, for the purpose of converting waste "furnace slag" into "Illinois Steel Portland Cement." This slag is run in its molten form into a pit, where water is turned on to it, which disintegrates or granulates it. It is then put into a roasting oven, after which it is allied with lime and other ingredients. The product is then ground to powder in a mill, from which it is packed into bags for market. This process has now passed the experimental stage and solves the problem of how to dispose of the heretofore worthless slag.

—A press report from Washington, May 19, states that the house commerce committee has favorably reported the bill amending the act of Feb. 8, 1881, granting a right of way for railway purposes through certain public lands in Richmond county, N. Y., so that the Staten Island Rapid Transit R. Co., may construct a 30-ft. tunnel through the lands of the United States, now occupied by the light-house establishment at New Brighton for the purpose of building a railway. It also provides that all railway companies shall enjoy the privileges of the tunnel.

—The contracts of the Standard Oil Co. aggregates 85 per cent of the oil used on the railroads in this country.

—The Bucyrus Steam Shovel & Dredge Co. of South Milwaukee, Wis., has received an order for the third hydraulic dredge to be used between Cario and Vicksburg on the Mississippi river. The boat which carries the machinery is to be 138 feet in length by 38 foot beam and 8 feet deep. The hull will be of steel. The engines will be of 800 horse-power and will drive a centrifugal pump having suction and discharge 34 inches in diameter. The estimated capacity of the machine is 2,500 cubic feet per hour. The suction is arranged to cut a channel of 35 feet in width at one cut and the discharge is 1,000 feet in length and carried on floats. The maximum depth of cut the machine will take is 15 feet. Steam is furnished by six externally fired marine return flue boilers. The work these dredges are employed in is that of cutting out sand bars which form each year across the channel of the Mississippi. Between Cairo and Vicksburg there are thirty-three of these, ranging in width from 400 to 2,400 feet. The width of the channel cut is from 100 to 250 feet. The dredges formerly built for this service by the Bucyrus people have been wonderfully successful and the placing of this order is the result of the satisfaction they have given to the government engineers.

—Mr. Clarence E. Rood, of Buffalo, N. Y., proprietor of the C. E. Rood Malleable Iron Works at Lancaster, N. Y., near Buffalo, announces his withdrawal from the Rood & Brown Car Wheel Works, that firm having expired by limitation. Mr. Rood also announces that he has sold out his interest in the East Buffalo Iron Works, of which Farrar, Trefts & Rood were the former proprietors. Action for the dissolution of this firm is now in progress. Mr. Rood is the sole owner of his extensive and fully up-to-date malleable iron works situated at Lancaster, N. Y., only nine miles from Buffalo, to which he is now devoting his undivided energy. These works make a specialty of malleable iron castings for railroad work and enjoy a large business. The business of these works has grown rapidly from the time of their construction a few years ago, and even now the need of their extension is sorely felt. Mr. Rood is assisted in the management of these works by Mr. Eugene Chamberlin, formerly of the New York Central, who is the general manager of the works. Both of these gentlemen are deservedly popular and have many friends, Mr. Chamberlin being widely known as the silver tongued orator of the great lakes.